Cybernetic Based Instruction: an Innovative Learning Model in Digital Age

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Abstract

Education is both a basic human right and a core element of sustainable development. Sustainable Development Goal 4 seeks to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.” With the advancement of technology, enrichment of online educational resources, and use of the internet, educational institutions worldwide are witnessing a massive trend towards the integration of technology within their education and learning methodology. The fulcrum of the learning process is being altered from teacher-centered, direct instruction to student-centered or active learning. One way to achieve student-centered learning is to make use of technology by incorporating interactive learning, video lessons and online interaction, where students can take the initiative in the learning process. This review paper explores the concept of CBI as a cutting-edge learning model in the digital age. The rapid advancements in technology have revolutionized the way education is delivered and received. CBI harnesses the principles of cybernetics to create an interactive, personalized, and data-driven learning environment. This paper examines the key features, benefits, and applications of CBI, highlighting its potential to transform education and prepare learners for the challenges of the digital era.

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Introduction

In the digital age, traditional educational approaches are being redefined to align with the evolving needs of learners(Yablonskaya, 2023). Cybernetic-Based Instruction (CBI) emerges as an innovative learning model that capitalizes on the advancements in technology and the principles of cybernetics.

Contemporary students are very technologically savvy, have vast understanding of the latest technological devices and learn better by visually enriched resources such as smartphones, computer and internet (Huang et al., 2020). It is not possible to draw the attention of these students using traditional methods that were used in the past. These traditional methods often a lack interactions between teachers and learners and limits learners from actively thinking, hence leading to poor development of their cognitive ability (Aruna & Thenmozhi, 2014; Huang et al., 2020).

After decades of research focused upon teaching and learning strategies, the effectiveness of an “active-learning” model has been clearly documented. With the advancement of technology and the enrichment of online educational resources, educational institutions worldwide are witnessing a massive trend towards the integration of technology within their education and learning methodology The fulcrum of the learning process is being altered from teacher-centered, direct instruction to student-centered or active learning One way to achieve student-centered learning is to make use of technology by incorporating interactive learning, video lessons and online interaction, where students can take the initiative in the learning process (Halasa et al., 2020).

Lecture or traditional method of learning is highly dependent on knowledge base and skill of the teacher requiring well organized content preparation and good communication skill of the teacher (Huang et al., 2020). Cybernetic Based Instruction (CBI) is a form of self-instruction in which the teacher facilitates and guides the students towards achieving the objectives of the lesson by utilizing the internet as a search tool. In lecture method students may receive the content by the instructor reading selected particular traditional books, attending class and taking notes. Whereas CBI make students

to learn by active learning, enrichment of collaborative learning, encouragement of greater students independence, and task based teaching (Aruna & Thenmozhi, 2014).

Modern learning theories, namely constructionism and social constructivism, posit that learning takes place when students are actively involved in their own process of learning through social interaction. However, research shows that teaching/learning continues to take place in the traditional way in this information age, even though there is a need to develop learners' critical thinking skills. This adherence to traditional practices is assumed to be due to instructors being unable to keep up with the pace of advances in pedagogy and emerging technologies (Almodaires et al., 2018).

Administrations of institutions of higher learning across the globe are challenging their respective faculties to incorporate this relatively new model into their classrooms. Some academic disciplines have embraced this approach to instruction with enthusiasm while others including nursing and midwifery discipline seem more cautious in moving towards adoption (Aruna & Thenmozhi, 2014).

Literature Review

Cybernetic Based Instruction (CBI) is an important feature of web based learning and it is based on the principles of self-learning. This situation requires existing educational programmes to be evaluated in line with these qualities and results (Şenyuva & Kaya, 2014). CBI, an emerging wave in teaching, is considered as a variant of flipped classroom and smart classroom. Instead of providing traditional in-class lectures, the concept of CBI is to allow the student search on the internet the content and objectives of the lesson, while the teacher serves as a facilitator (Baron & Africa, 2015). As student-centered learning is the core of CBI, the main task of the teacher is to highlight the content of the lesson and moderate the answers of the students, but not to deliver lectures. CBI provides an environment in which the student is at the center of focus and provides an opportunity during class time for students to develop higher order thinking under the teacher's guidance and with peer support. Instead of relying on traditional in-class lectures, CBI shifts the focus to the student's active role in searching for and discovering content and learning objectives on the internet, while the teacher assumes the role of a facilitator.

CBI leverages the vast resources available on the internet to promote self-directed learning. Students are encouraged to explore relevant content and educational materials online, fostering a sense of autonomy and responsibility in their learning process. The internet becomes a valuable tool for accessing information, conducting research, and engaging with diverse learning materials. The core principle of CBI is student-centered learning. The instructional focus shifts from a teacher-centered approach to empowering students to take ownership of their learning journey. By actively participating in the discovery of knowledge, students become more engaged, motivated, and invested in their education.

CBI shares similarities with the flipped classroom and smart classroom models. In a flipped classroom, students access instructional materials outside of class, allowing for more interactive and collaborative activities during class time (Halasa et al., 2020). CBI takes this concept further by emphasizing student-led content exploration through internet-based resources. Additionally, the smart classroom aspect of CBI involves using technology to facilitate learning and enable

personalized experiences.

In CBI, the role of the teacher shifts from being the primary source of information to that of a facilitator and guide. Instead of delivering lectures, the teacher focuses on directing students towards relevant resources, highlighting key concepts, and moderating class discussions. The teacher's role becomes more interactive, fostering meaningful dialogue and critical thinking. With the teacher's guidance and peer support, CBI provides an environment conducive to the development of higher-order thinking skills. Class time is dedicated to engaging discussions, problem-solving, and activities that promote deeper understanding and application of knowledge.

Theoretical Foundations of Cybernetic-Based Instruction

The theoretical foundations of Cybernetic-Based Instruction (CBI) draw upon principles from cybernetics and educational technology. CBI leverages these foundations to create an innovative learning model that optimizes the educational process in the digital age. Below are the key theoretical foundations of CBI:

Cybernetics

Cybernetics is not a new invention but its potential for application has not exhausted even after nearly seventy years of its origin. It started with idea of automation and control in the electrical and mechanical systems, but later on extended to biological, social systems and learning systems (Kumar Grover, 2016). At the core of CBI lies the field of cybernetics, which studies systems and their control mechanisms. Cybernetics explores the principles of feedback, regulation, communication, and self-organization in complex systems. These concepts are applied to the design of instructional processes and learning environments to create dynamic and adaptive learning experiences.

Educational Technology

Educational technology is a field of study that investigates the process of analyzing, designing, developing, implementing, and evaluating the instructional environment and learning materials in order to improve teaching and learning (Bhar, 2018). Educational technology is instrumental in the implementation of CBI. It encompasses a wide range of digital tools and platforms that enhance the learning process and enable innovative instructional methods.

The Cybernetic Theory

Wiener (1948) defined cybernetics as “a flexible, self –adapting mechanism which is capable of storing information and changing its responses according to the changing environment in which it is placed. Cybernetic theory views an individual as a feedback system which generates its activities in order to detect and control specific stimulus characteristics of the environment. It analyses intrinsic mechanism by which control is established and sensory feedback mechanism

maintained. The focus of the whole theory is the dynamic feedback and self regulation. All systems include at least three basic elements; input, process and output (Wiener, 1948).

1. The input unit; It provides some process by which material or information's entered the system.
2. The process unit; It acts on the material of information to modify it in any way.
3. The output unit; It consists of some technique for discharging the results of process from the system. The output is called feedback.

Key Features of Cybernetic Based Instruction

- Interactive Learning: CBI encourages active participation and engagement from learners. It provides interactive learning materials and simulations that allow students to explore concepts, apply knowledge, and receive immediate feedback. This hands-on approach promotes a deeper understanding of the subject matter.
- Personalized Learning: With CBI, learners can receive personalized instruction tailored to their individual needs and preferences. Adaptive learning systems can analyze learner data, track progress, and adjust the content and pacing accordingly. This personalized approach helps students learn at their own pace and focus on areas where they need improvement.
- Real-World Applications: CBI emphasizes the application of knowledge to real-world scenarios. It enables students to solve authentic problems and challenges, simulating real-life situations. This practical approach enhances students' critical thinking, problem-solving, and decision-making skills.
- Continuous Assessment: CBI integrates ongoing assessment and feedback mechanisms. It allows instructors to monitor student progress in real-time, identify areas of difficulty, and provide timely support. Additionally, learners can track their own progress and identify areas where they need to improve.
- Collaborative Learning: CBI facilitates collaboration among learners and encourages peer-to-peer interaction. Online platforms and tools enable students to collaborate on projects, engage in discussions, and share knowledge and resources. Collaborative learning fosters communication skills, teamwork, and social interaction, even in remote or online learning environments.
- Data-Driven Instruction: CBI leverages data analytics to inform instructional decisions. By collecting and analyzing data on learner performance, engagement, and behavior, instructors can gain insights into the effectiveness of their teaching strategies. This data-driven approach enables continuous improvement and optimization of the learning experience.
- Lifelong Learning: CBI promotes lifelong learning by fostering self-directed and autonomous learning skills. It equips learners with the necessary digital literacy and information management skills to navigate the ever-evolving digital landscape. CBI encourages a mindset of continuous learning and adaptability, preparing students for the challenges of the future.

Application of Cybernetic-Based Instruction in the Classroom

- Start by setting clear learning objectives for your lesson or course. What do you want your students to achieve by the end of the instruction? Ensure these objectives are specific, measurable, and achievable.
- Identify digital resources, such as websites, e-books, simulations, or online databases that can support the achievement of these objectives.
- In the classroom, ask students to turn on their computers/smartphones and connect to the internet. Ensure that all students have access to the necessary technology and a reliable internet connection.
- Introduce the First Learning Objective: Pick the first learning objective, and explain it to the students. Ensure they understand what is expected of them
- Online Research: Ask students to use various search engines, such as Google, Bing, or educational search engines like Google Scholar, to find information related to the first learning objective. Emphasize the importance of using appropriate keywords and credible sources.
- Evaluate Sources: Teach students how to evaluate the credibility and reliability of online sources. Discuss factors like authorship, publication date, and peer-reviewed content.
- Encourage Sharing: The teacher should encourage students to share the information they have found with the entire class. This sharing can take various forms:
- Facilitate Discussion: After students have shared their findings, facilitate a discussion about the learning objective. Encourage critical thinking by asking open-ended questions and promoting peer-to-peer interaction.
- Repeat the Process: Repeat this process for the remaining learning objectives, allowing students to explore different aspects of the topic through online research and sharing.
- Formative Evaluation: Depending on the lesson's objectives, design assessments that gauge students' understanding and application of the researched information.
- Provide timely and constructive feedback on students' performance. Use digital tools for grading and feedback delivery.
- Final Assessment: At the end of the lesson, conduct a summative assessment to evaluate whether students have achieved the overall learning objectives. Reflection and Adaptation:
- After the lesson, reflect on the effectiveness of the CBI approach. Gather feedback from students on their learning experiences. Use this feedback to adapt and improve future lessons.
- Encourage students to view this experience as a model for lifelong learning. Emphasize the importance of using technology and online resources for continuous self-education and staying updated in their fields.

By following these steps, teachers can effectively apply Cybernetic-Based Instruction in the classroom, promoting active learning, digital literacy, and critical thinking skills among students. This approach empowers students to take ownership of their learning and prepares them for the demands of the digital age.

Benefits of Cybernetic-Based Instruction

- CBI encourages active learning and engagement among students, as they are involved in the search for information and content. This hands-on approach fosters a deeper understanding of the subject matter.

- By allowing students to explore content at their own pace and according to their interests, CBI supports personalized learning experiences, catering to diverse learning styles and preferences.
- CBI provides opportunities for peer collaboration and discussion during class time, promoting teamwork and communication skills.
- Leveraging the internet, CBI expands the pool of resources available to students, granting them access to a wealth of information and perspectives.
- CBI promotes active learning and engagement among students. By involving students in interactive activities, simulations, and real-world applications, CBI makes learning more meaningful and relevant. The dynamic and interactive nature of CBI captures students' attention, fostering a deeper understanding of the subject matter.
- With CBI, students receive immediate feedback on their performance and progress.
- CBI empowers students to take ownership of their learning journey. By encouraging self-directed learning and resource exploration, students develop valuable research skills and become more independent learners, better equipped for lifelong learning.
- CBI can be cost-effective for educational institutions in the long run. While initial setup costs may be involved, once established, digital resources and online platforms can be reused, reducing the need for continuous investment in physical materials.

Limitations

1. **Distraction:** Students can easily get distracted on the internet with social media notifications, adverts and so on.
2. **Technology Dependence:** CBI heavily relies on technology, which can be a barrier for both students and instructors. Not all students may have access to the necessary devices or a stable internet connection, leading to inequalities in learning opportunities.
3. **Digital Divide:** The digital divide refers to the gap between those who have access to technology and those who do not. CBI can exacerbate this divide, as some students may struggle to participate fully in digital learning environments due to limited access or digital literacy.
4. **Overwhelming Content:** The abundance of digital resources and information available online can overwhelm students. Without proper guidance, students may struggle to sift through vast amounts of content to identify relevant and credible sources.
5. **Lack of Motivation:** Some students may find it difficult to stay motivated in technology-driven learning environments.
6. **Technical Issues:** Technical problems such as software glitches, internet outages, or hardware malfunctions can disrupt the learning process and cause frustration for both students and instructors.
7. **Teacher Training:** Implementing CBI effectively requires instructors to be proficient in using digital tools and online platforms. Many educators may need training and support to adapt to this mode of instruction.
8. **Cheating and Plagiarism:** Online assessments and assignments may be more susceptible to cheating and plagiarism, as it can be harder to monitor students' behavior and ensure academic integrity.
9. **Limited Hands-On Learning:** Some subjects, such as laboratory sciences or vocational training, require hands-on

experience that may be challenging to replicate in a purely digital environment.

Conclusion

In conclusion, Cybernetic-Based Instruction (CBI) represents a transformative paradigm in education, tailor-made for the digital age. This innovative approach, rooted in the principles of cybernetics, redefines the educational landscape by offering enhanced interactivity, personalization, real-world relevance, advanced assessment methods, collaborative learning opportunities, data-driven insights, and a foundation for lifelong learning. The findings from this exploration into CBI underscore its potential to revolutionize education in the digital era.

The significance of CBI lies in its capacity to create dynamic and engaging learning experiences that resonate with the needs and expectations of contemporary learners. It provides a framework for educators and policymakers to bridge the gap between traditional pedagogical methods and the demands of the digital age. By harnessing the power of technology and adaptive learning systems, CBI equips students with the skills, knowledge, and critical thinking abilities necessary for success in an increasingly complex and technologically driven world.

As we move forward, it is imperative for educators and policymakers to embrace the principles of Cybernetic-Based Instruction. This entails integrating CBI into curricula, fostering an environment of technological fluency, and investing in the professional development of educators. The practical takeaways from this study emphasize the need for a concerted effort to implement and scale CBI initiatives, ensuring that education remains a catalyst for individual growth, societal progress, and global competitiveness in the digital age.

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