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A Proposed Conceptual Framework for Activating Hybrid Learning for Students with Chronic Illnesses Using Smart Digital Platforms

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Abstract

The research aims to present a proposed framework for activating hybrid learning as a strategic solution to ensure continuity of education and learning for students with chronic illnesses whose health conditions prevent regular school attendance. It addresses the academic and psychological challenges faced by this group during periods of absence from school, reviews relevant Arabic and foreign literature analytically, and examines the nature of hybrid learning and smart digital platforms. Based on a descriptive-constructive methodology, the study proposes a framework integrating the "Flex Model" with AI-based smart digital platforms to provide an adaptive learning environment that accommodates students' treatment periods and ensures they remain connected to the classroom community during treatment and recovery.

Keywords: Hybrid learning, students with chronic illnesses, smart digital platforms

1. Introduction

The field of education has witnessed an unprecedented qualitative shift, with global transformations in learning patterns. Physical presence in the classroom is no longer the sole means of learning and knowledge acquisition.

Amid these rapid changes, a group of students is often overlooked in educational contingency plans: students with chronic illnesses (e.g., cancer, kidney failure, heart disease, severe diabetes, asthma, immunodeficiency, etc.), who spend long periods in hospitals or at home receiving treatment away from classrooms.

Due to frequent or prolonged absences, this group faces an **educational gap** that widens with each day of absence, leading not only to academic delay but also to social isolation, frustration, and depression.

To bridge this gap, a modern educational approach, **hybrid learning**, emerges not as a technological luxury but as a necessary strategy to integrate these students according to their academic levels. It leverages smart digital platforms using learning analytics to design flexible learning pathways that accommodate their fluctuating health conditions, addressing the limitations of traditional mechanisms (e.g., conventional hospital schools) that fail to align with regular curricula or facilitate social interaction with peers.

Hybrid learning combines in-person and online learning, providing flexibility for learners to access educational resources despite absences due to illness or treatment. Christensen (2013) describes it as a formal educational program combining institutional learning, remote learning, and methods integrating both forms.

Graham (2006) noted that hybrid learning represents a "transitional model," merging the best of traditional and e-learning while allowing greater interaction and personalization. Hrastinski (2019) emphasized that hybrid learning is not merely a mix but a new educational philosophy requiring curriculum and

activity redesign to meet learners' needs. This is particularly important for students with chronic illnesses, who require flexible environments for continuous learning.

Regarding psychological and social support, Borup, Graham, & Davies (2013) found that teacher engagement in digital environments plays a crucial role in student support, as human interaction remains essential for online learning success. This underscores the need for designing smart digital platforms that enhance interaction and provide tracking and analytical tools for monitoring progress of chronically ill students.

Al-Azawei, Serenelli, & Lundqvist (2016) explored **Universal Design for Learning**, focusing on flexible educational environments that respond to individual differences. This concept can support frameworks for activating hybrid learning for this group, ensuring adaptability of platforms to their needs.

Globally, UNESCO (2021) highlighted that digital transformation in education is urgent, and smart platforms serve as strategic tools for educational inclusion and minimizing gaps among different learner groups. This emphasizes that investing in hybrid learning is a necessity to address health and social challenges in education.

Thus, there is a clear need for a proposed framework for activating hybrid learning for students with chronic illnesses using smart digital platforms, ensuring equal educational opportunities, academic and social integration, and reducing the negative effects of frequent absenteeism.

Research Question: "What is the proposed framework for activating hybrid learning for students with chronic illnesses using smart digital platforms?"

Sub-questions:

1. What are the educational and psychological challenges faced by students with chronic illnesses?
2. What are the findings of previous Arabic and foreign studies on hybrid learning for this group?
3. What technical features are required in educational platforms to support these students, and how can they be prioritized?
4. What are the components of the proposed framework (philosophy, objectives, implementation mechanisms)?

2. Research Objectives

The research aims to:

- Understand hybrid learning and how it can benefit students with chronic illnesses.
- Explore smart digital platforms and how they can be utilized for remote learning of chronically ill students.
- Identify educational and psychological challenges faced by students with chronic illnesses.
- Present a proposed framework for activating hybrid learning for students with chronic illnesses using smart digital platforms, ensuring their integration and improving their educational opportunities compared to their peers.

3. Research Significance

Scientific & Pedagogical Importance:

- Focuses on the impact of hybrid learning on the cognitive development of students with chronic illnesses and educational quality.
- Improves learning outcomes for ill students.
- Provides temporal and spatial flexibility by combining in-person and remote learning for students absent due to illness.
- Offers diverse knowledge resources for students.
- Promotes self-regulation and responsibility through asynchronous components, enhancing metacognitive skills and independent learning.
- Accounts for individual differences, allowing ill students to learn at their own pace online while in-person

sessions focus on social support and discussion.
- Enriches Arabic literature linking e-health and hybrid learning for students with chronic illnesses.

Practical & Operational Importance:
- Hybrid learning using smart digital platforms provides a practical solution for absenteeism, allowing students at home or in hospitals to continue learning without daily school attendance.

4. Study Terminology

Hybrid Learning: Ahmed et al. (2023) define it as using technology to deliver information efficiently to students, enhancing higher education access. Graham (2006) describes it as a model combining traditional and e-learning as a transitional stage toward more flexible educational design.

Operational Definition: Hybrid learning is an educational model combining face-to-face and remote learning via smart digital platforms, synchronously or asynchronously, tailored for chronically ill students during hospitalization or recovery.

Smart Digital Platforms:
- Al-Fifi (2020, p.144): Interactive learning environments using Web2 technology, combining content management and social networking for student engagement.
- Al-Ansari (2021, p.38): Websites offering educational courses with interactive, application-rich environments leveraging computer networks and multimedia, supporting self-paced learning.
- Khamis (2023, p.96): Technological tools supporting education, delivering content flexibly anytime and anywhere via modern electronic devices.

  Operational Definition: Integrated e-learning systems (e.g., Moodle, Blackboard) using AI and data analytics to provide adaptive, flexible educational experiences for ill students, featuring:
  - Adaptive learning
  - Personalized recommendations
  - Real-time performance tracking
  - Supporting communication between students, teachers, and peers

Students with Chronic Illnesses: Students across educational stages with ongoing, recurrent, or long-term health conditions affecting regular classroom participation. Examples include respiratory, gastrointestinal, cardiac, immune, dermatological, neurological conditions, diabetes, celiac disease, and cancer. These conditions may require absence or learning adjustments and often involve psychosocial challenges.

5. Literature Review

Foreign Studies:

1. **Taylor, Van Winkel, & Zhu (2022):** *A teacher perspective on using a hybrid virtual classroom for students with a chronic illness in mainstream primary and secondary schools.*
- Objective: Explore teacher beliefs and experiences using video conferencing for remote learning of ill students in a hybrid setting.
- Method: Mixed-method on 77 primary and secondary school teachers.
- Tools: Online survey and semi-structured interviews.
- Results: Hybrid classrooms supported learning continuity, enhanced social well-being, and reintegration, with pedagogical rather than technical challenges in managing attention of in-person and remote students.

2. **TRIS Project (2021):** *Hybrid Inclusive Classroom for Homebound Students.*
- Objective: Develop and test hybrid classrooms using telepresence robots.
- Method: Experimental case study.
- Sample: Students with attendance-preventing illnesses in selected European schools.

- Tools: Direct observation and platform-based academic tracking.
- Results: Robots and hybrid platforms significantly reduced isolation; combining live and recorded content accommodated physical fatigue.

3. **Gilmour, Hopkins, & Meyers (2015):** *School functioning issues in children with chronic health conditions.*
- Objective: Analyze chronic illness impact on student academic and functional performance.
- Method: Descriptive-analytical systematic literature review.
- Sample: Records from children's hospitals and affiliated schools in the U.S.
- Tools: Document and medical-educational report analysis.
- Results: Students with chronic illness underperformed due to frequent absence, not lack of intelligence; recommended flexible, interactive individualized education plans integrating technology.

Arab Studies:

1. **Khamis, Salama, & Ashour (2023):** *Proposed framework for achieving hybrid learning goals in inclusive schools using smart platforms.*
- Objective: Theoretical and practical framework for using smart platforms for inclusive students, including those with special health conditions.
- Method: Descriptive-constructive to build the framework.
- Results: Professional development for teachers, training sessions to promote smart platform use, and address learning challenges in inclusive schools.

2. **Abdel-Aty (2023):** *Proposed framework for achieving hybrid learning goals in inclusive schools using smart platforms.*
- Objective: Theoretical and practical framework for using smart platforms for inclusive students.
- Method: Descriptive-constructive.
- Sample: Analysis of inclusive schools in Egypt.
- Tools: Content analysis of available educational platforms, expert surveys.
- Results: Hybrid learning provides critical time flexibility; current platforms lack automatic content adaptation, requiring AI integration.

3. **Rufaida Adnan Al-Ansari (2021):** *Trends toward using e-learning platforms among Taibah University students.*
- Objective: Examine trends in e-learning platform usage and differences by academic specialization; identify preferred platforms.
- Method: Quasi-experimental and descriptive-analytical.
- Sample: 126 female students selected via purposive random sampling.
- Tools: Questionnaire with 24 items across positive and negative reinforcement dimensions, validated for reliability.

Main Results: The study results showed that the sample's attitude toward using electronic learning platforms was positive, with an overall mean of (2.32), rated as (high). The study did not reveal any statistically significant differences attributed to the academic specialization variable. Regarding the preferred learning platform from the sample's perspective, the Droob platform ranked first with (72.22%), followed by Edraak with (15.08%).

4. Study by Sultan Ibrahim Al-Fifi (2020), titled: The Effect of Different Control Modes of Interactive Video Clips via Learning Platforms on Developing Robot Programming Skills for Third-Year

Intermediate Students in Saudi Arabia.

• Objective: To identify the effect of different control modes of interactive video clips via learning platforms on developing robot programming skills included in Unit 4 (My Robot Friend – Smart Devices and Robot) from the Computer and Information Technology textbook for third-year intermediate students in Saudi Arabia.

• Methodology: Quasi-experimental method.

• Sample: The study sample consisted of (50) intermediate students, randomly assigned into two experimental groups: the first group of (25) students received interactive videos with learner-controlled mode, and the second group of (25) students received videos with program-controlled mode.

• Research Tools: Achievement test and programming skills observation sheet.

• Main Results: The results revealed statistically significant differences at the (0.05) level between the average scores of the two groups in both the test and the observation sheet. The differences favored the first experimental group, which used the learner-controlled video mode. The study recommended benefiting from interactive video platform services in the educational process.

5. Study by Lama Nazem Al-Droubi (2020), titled: A Proposed Model to Improve Interactive E-Learning Platforms in Syrian Universities.

   • Objective: To explore the main features of interactive learning and their impact on the success of the educational process by discussing current teaching methods in educational institutions, identifying problems observed by students and teachers in traditional education (lectures, written assignments, and examination systems), and exploring weaknesses within the educational process.

   • **Methodology: Descriptive.**

   • Sample: Included various student groups randomly selected from Syrian universities to gather their opinions and experiences in traditional or electronic learning.

   • Tool: Student questionnaire.

   • Main Results: The results indicated a significant need among students to incorporate modern tools in education to increase effectiveness and enhance communication with teachers. The study explored technologies used in education (interactive whiteboards, smart devices) that transformed teaching from traditional to interactive e-learning. Using the MVC (Model-View-Controller) technology, the study proposed an e-learning model to facilitate interaction among all educational stakeholders, defining main controllers and services, improving communication, and standardizing various e-learning systems across platforms and programming languages.

6. Study by Halima Al-Zaji (2012), titled: E-Learning at Algerian Universities: Implementation Components and Barriers.

   • Objective: To examine the foundations of e-learning in Algerian universities, distinguishing between synchronous e-learning (with active interaction among educational stakeholders) and asynchronous or blended e-learning, and presenting barriers and requirements. The study also explored instructional design, its importance, and stages, and finally discussed the education system at

Skikda University and ways to improve it. This study aids in integrating Algerian educational models.

General Commentary on Previous Studies and the Position of the Current Study:

1. Previous studies (Taylor, 2022; TRIS, 2021) agree that "hybrid learning" is the optimal solution for social and academic inclusion of students with special health conditions.
2. Arab and foreign studies focused on technical and organizational aspects.
3. Research Gap: The Arabic literature lacks a "comprehensive procedural model" integrating (smart platforms) with (protocols for interacting with sick students), which this study seeks to provide by proposing specific mechanisms for smart platforms rather than merely using traditional video conferencing.

6. Successful International Experiences Documented Academically, Divided by "Implementation Model":

1. Norway and the United Kingdom (Weijs, M. L., et al., 2019): "AV1 Robot"
   • Concept: Overcoming depression and isolation for children with cancer or immune disorders; the student needs to feel "present" in school, not just receive information.
   • Implementation (AV1 Robot):
   o A small robot (doll-sized) is placed at the student's desk.
   o The student controls it from the hospital via a tablet (iPad).
   o The robot can turn its head to look at peers, flash a blue light to raise a hand, or a light blue to indicate listening.

o Feature: Peers can carry the robot to the schoolyard to communicate with the student, achieving full social inclusion.

2. Italy: TRIS Project (Benigno, V., Fante, C., & Caruso, G., 2017) – Hybrid Inclusive Classroom
   • Concept: Italy transitioned from homebound education to hybrid inclusive education, integrating sick students socially and academically.

• Implementation:

o Classroom equipped with smart cameras and microphones.

o The student participates in real-time from home/hospital.

o Focus on interaction rather than just watching the lesson; the sick student collaborates with groups via the screen.

3. Australia (Hopkins, L., et al., 2014): "Missing School" Initiative
   • Concept: National nonprofit initiative with the Ministry of Education to ensure continuous connection.

• Implementation:

o Telepresence robots allow students to virtually "move" around school and attend labs.

o Studies showed reduced anxiety upon returning to school after recovery.

4. United States: Hospital Schools (Stanford Children's Health)

• Implementation:

o Major hospitals host regular schools.

o Hybrid learning connects the student to their home school, while hospital teachers provide direct support.

o Objective: Prevent academic gaps and ensure smooth transition post-hospitalization.

Lessons from International Experiences for Hybrid Learning with Smart Platforms:

1. Social presence: Technology and smart platforms should enable students to interact and chat with peers, not just listen to the teacher (AV1 Robot).
2. Synchronicity: Live streaming is psychologically better than recorded

videos, fostering a sense of belonging (Italy).

3. Dual training: Regular school teachers trained to handle a "virtual student" and not ignore the screen or robot (Australia).

7. Proposed Model for Activating Hybrid Learning for Students with Chronic Illness Using Smart Digital Platforms

1. Foundations of the Proposed Model:

1.1 Philosophical and Legislative Foundations in Algeria:

• Algerian Constitution: Right to education guaranteed for all.

• Administrative flexibility: Recognizing "digital attendance" as legally equivalent to physical attendance, allowing sick students to take official exams without exclusion due to absence.

1.2 Technical Foundations:

1.2.1 Proposed Smart Digital Platform "Smart Companion Platform"

• Instead of relying on separate apps (Zoom, Google Meet), this study proposes developing or customizing a national central platform with "smart" specifications specifically for students with chronic illnesses in Algeria.

1.2.2 Adaptive Learning Management System (LMS)

• Mechanism: The platform uses AI to analyze educational progress, accommodating students who may have intermittent and frequent absences due to illness (cancer, kidney failure, diabetes, respiratory or immune diseases).

• Function: Lessons are rescheduled in small doses (micro-learning) matching the student's current health condition.

1.2.3 Hybrid Virtual Classroom (The Hybrid Window)

• Equipment: One classroom per middle/high school with wide-angle camera and surround microphone.

• Application: Students in hospital can view the board and hear the teacher and peers live, reducing social isolation.

1.3 Pedagogical Mechanisms:

1.3.1 Micro-Learning Strategy

• For students undergoing chemotherapy or dialysis who experience fatigue quickly.

• Proposal: Convert long lessons (45 min) into short video capsules (5–10 min) available in the platform library with brief interactive assessments.

1.3.2 Peer Buddy System

• Two students in the real classroom assigned as "ambassadors" to communicate with the sick student, transmit handwritten notes, and relay questions during live sessions.

1.4 Organizational and Administrative Mechanisms (Roadmap for Implementation in Algeria):

• Success requires partnership among Ministry of Health, Ministry of National Education, and

Entity	**Role**
Ministry of National Education	Legislate legal status for hybrid students; provide digital tablets for medically registered chronic students; train teachers on using digital platforms and hybrid teaching; provide equipped rooms for synchronous lessons; enhance platform quality and content; guide parents for home learning.
Ministry of Health	Provide high-speed Wi-Fi in hospital children's wings; dedicated classrooms; assign teachers to help students learn via the platform.
Algeria Telecom	Provide free or subsidized subscriptions (Zero-rating) to the educational platform so students do not consume internet data when accessing lessons.

2. Objectives of the Proposed Model:

1. Ensure equal educational opportunities for sick students via hybrid learning materials.
2. Achieve zero dropout in the educational path for sick students.
3. Transform smart digital platforms from information delivery tools into diagnostic and adaptive tools according to each student's health condition.
4. Ensure students with chronic illnesses achieve the same educational goals as healthy peers via high-quality interactive content.
5. Maintain social connections with classmates, integrating the sick student effectively whether physically present or remote.
6. Ensure accessibility of smart digital platforms according to global standards and ease of use for all students regardless of visual or mobility limitations.
7. Achieve over 85% user satisfaction (students/parents/teachers) regarding platform ease of use.
8. Improve teacher competency via training in hybrid learning tools and AI platform features (adaptive assessment, learning analytics).
9. Create a unified data system linking attendance records, academic performance (LMS), and health monitoring for a comprehensive view of the student's status.

3.Requirements of the Proposed Model:

Implementing hybrid learning for students with chronic illnesses requires special requirements exceeding those for regular students, ensuring maximum temporal flexibility, health, psychological and social support, and educational quality. The requirements are divided into four axes:

Axis 1: Technical and Infrastructure Requirements

1. Adaptive smart LMS supporting synchronous and asynchronous learning.
2. Platform compliance with WCAG accessibility guidelines, supporting students with visual, auditory, or mobility limitations.
3. Provision of appropriate devices (lightweight laptops, tablets) and stable high-speed internet at home or hospital.
4. Tools for synchronous interaction (e.g., multi-angle classroom cameras) for immersive learning from home.

Axis 2: Pedagogical and Methodological Requirements

1. Modular and chunked design: curriculum divided into small independent units (micro-learning) for completion during student's alert periods without fatigue.
2. Flexible assessment: emphasize continuous assessment and project-based tasks over exhausting exams.
3. Multiple resources: provide content in various formats (videos, texts, diagrams, audio) to accommodate health limitations.
4. Clear documented "Transition Protocol" specifying when and how the student moves from face-to-face to remote learning using the smart platform, with immediate notification to all stakeholders.

Axis 3: Organizational and Administrative Requirements

1. Assign a school coordinator to manage communication among teacher, student, parent, and health counselor, ensuring information flow on health and academic adaptation.
2. Implement flexible attendance and absence policies, considering health-related absences as non-academic if compensated via the platform.
3. Train teachers in AI techniques within smart platforms to adapt education and understand sick students' needs (fatigue

management, medication effects, hybrid classroom management).

4- Protecting the student's health and academic data shared between parents, the coordinator, and the teacher (in accordance with applicable local policies).

Axis Four: Health, Psychological, and Social Requirements: These requirements relate to integrating non-academic support to ensure the safety and psychological well-being of the sick student, through:

1- Opening dedicated electronic communication channels with the school's psychological or social counselor, ensuring easy access from home to address any anxiety or frustration related to illness or studies.

2- Supporting remote social interaction by designing classroom activities that require virtual collaboration (e.g., group projects completed via Google Docs) to strengthen bonds between the student and peers.

3- Following up with the family by establishing a regular communication system with the parent, considering them a key partner in managing hybrid learning, providing simplified dashboards showing the child's academic and health progress.

4- Designing a home learning environment that considers the student's health, ensuring it is comfortable and distraction-free at home or in the hospital.

5- Providing parents with guidelines on setting flexible learning time limits that do not pressure the student and accommodate their need for rest according to their health condition.

Conclusion:

After reviewing the concepts of this research, previous foreign and Arab studies, and documented international experiences, it is confirmed that the proposed model for activating hybrid learning mechanisms supported by smart digital platforms represents a practical solution for educating students with chronic illnesses. It provides them with a flexible, adaptive, and supportive learning environment. Illustrative examples demonstrate that this model is feasible but requires institutional support and clear educational policies to ensure its effectiveness and sustainability.

Based on the above, we propose the following recommendations:

- Review educational legislation and recommend enacting laws that recognize hybrid learning as an official option for students with chronic illnesses and other categories according to their condition.
- Provide financial resources to develop smart platforms and update digital infrastructure in schools.
- Ensure educational equity by implementing policies guaranteeing all students access to devices and the internet, especially vulnerable groups.
- Activate collaboration with the Ministry of Health by linking health and educational data to ensure accurate monitoring of students with chronic illnesses.
- Organize specialized training programs for teachers on using smart platforms and adapting content for students with chronic illnesses.
- Develop and redesign curricula to be applicable in a hybrid environment while considering individual differences among learners.
- Adopt assessment mechanisms combining in-person and virtual tests to ensure comprehensive evaluation of student performance.
- Provide psychological and social support for sick students.
- Involve parents in their children's learning by monitoring progress through smart platform reports.
- Promote community awareness about the importance of hybrid learning and collaborate with civil society organizations to provide material and moral support for sick students.

- Finally, propose further studies to complement and deepen the current research to address points not fully covered.

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