



## Integrating Technology with Constructivist Pedagogy

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### Abstract

Technology and constructivism are closely intertwined with the application of one assisting the other. Constructivism is a school of thought that holds that learning occurs in contexts, whereas technology refers to the designs and situations that engage learners. Recent initiatives to incorporate technology in the classroom have used a constructivist approach. This article aims to understand the interaction between constructivism and technology by reviewing various studies conducted in this regard. Further, it tries to determine whether technology is a crucial component of constructivist pedagogy and how it fits in with our contemporary classrooms. Last, the article presents the implications of technology and constructivism for teachers and teacher educators.

**Keywords: Constructivism, Pedagogy, Technology**

### 1.Introduction

Constructivism is a philosophical and psychological approach based on social cognitivism that assumes that people, behaviors, and environments interact reciprocally. It is primarily derived from the works of Piaget (1970), Bruner (1962, 1979), Vygotsky (1962, 1978), [1]. Constructivism is a concept that holds that learning occurs in contexts and that learners develop or build much of what they learn and comprehend as a result of their experiences within these contexts [1].

Computer technology's usage to promote learning has been difficult to monitor and measure making computers' role in the classroom uncertain. Over the last decade, there has been a noticeable resurgence of interest in the classroom implementation of technical innovations, as well as growing usage of the Internet and other digital technologies [2]. In the field of Instructional Design and Technology, alternative methods, including cognitive and constructivist theories departed dramatically from established techniques such as behavioral models. New emphases, such as electronic performance support systems, web-based training, and knowledge management systems, have not only shaken the field's knowledge base, but have also broadened its vision across business and industry, the military, health care, and education, all over the world [2]. Initiatives such as contextual learning theory and constructivism has provided novel methods for reforming public education and higher education [2][3][4][5]. Many scholars have studied the influence of constructivism in classroom practices to better understand the potential of technology deployment in strengthening the teaching-learning process [6]. Other scholars have proposed that constructivist tactics maximize the influence of technology on learning [7]. Computer technology and constructivism appear to have a complimentary connection, with the implementation of one aiding the other.

The goal of this paper is to review the research works conducted on technology integration in schools while focusing on the relationship between constructivism and technology. Central to the discussion is the constructivist perspective of learning as an active process of creating rather than obtaining information, and teaching as a process that encourages construction rather than imparting knowledge. Finally, we discuss its implications for teachers and teacher educators in their teaching practice.

## 2. Review of Related Literature

To comprehend learning as an action in context within a constructivist framework, the entire learning environment must be evaluated. However, the vast range of constructivist viewpoints makes the task extremely difficult and beyond the scope of this work. These perspectives frequently highlight the role of the instructor, the learner, and the cultural embeddedness of learning [7] [8]. Using these characteristics as a guide, this paper examines the link between constructivism and technology by examining the following:

- (a) Technology as cognitive tools
- (b) The constructivist perspective of the thought process,
- (c) The role of the teacher in technology-enhanced environments.

### 2.1 Technology as Cognitive Tools

Constructivism holds that learning is mediated by tools and signals [7] [9]. Participants in the culture adopt these cultural instruments to achieve their aims, transforming their engagement in the culture [7]. The computer is an example of a mediational method that is both a tool and a symbol. The computer's function in education has primarily been considered as an educational tool capable of creating a more rich and interesting learning environment [7] [10]. However, by concentrating on the learner, technology may help to promote new understandings and capacities, providing a cognitive tool to enhance the cognitive and metacognitive processes. An internet exchange program, for example, exchanges diverse cultural viewpoints through images, tales, letters, and multimedia programs between students in a class in the United States and a comparable classroom in Northern Ireland [7]. The event was enlightening and expanded their perspective.

Several scholars agree with the concept of technology as a cognitive tool [10] [11]. The conventional perspective of instructional technologies as information conveyors and transmitters of knowledge has given way to an active role for the student in learning using technology. Technologies, particularly computers, aid in the development of knowledge bases, which engage learners more and result in more meaningful and transferrable information. Learners act as designers, employing technology to analyze the world, obtain information, interpret and organize their knowledge, and communicate what they know to others [11]. Students can utilize technological tools like spreadsheets, databases, expert systems, video conferencing, and others to assess subject content, construct representative mental models, and then transcribe them into knowledge bases [10] [11]. Multimedia software has proven to be an effective learning environment for students with the use of cooperation and project management. The interaction between team members, the flow of ideas, and the children's loud thinking pushed them to explore and create new methods of designing and solving challenges. For example, the students worked on distinct characters independently but then collaborated to integrate and debug all of the characters [12].

Cognitive tools do not restrict the use of computers to boost learning productivity. Offloading repetitive and lower order activities to cognitive tools frees up cognitive resources for deeper thought and minimizes mistakes [7][13]. Teachers and students must be taught to utilize the computer as a productivity tool as well as a tool for learning, research, networking, collaboration, telecommunications, and problem-solving [14].

### 2.2 The Constructivist perspective of the thought process

In constructivist paradigms, thinking needs higher-order abilities, diving deeper and harder into content and context [15] [14]. Traditional schooling suppresses creative thinking by focusing on transferring current information, which contradicts any genuine endeavor to produce a new understanding. Constructivist thinking integrates both analytical and creative mental processes. It may be practiced by incorporating critical thinking into tasks. Schools, instructors, and students can be trained to deviate

from typical schooling regimens to promote constructive thinking [15]. Cognitive tools, in conjunction with constructivist learning settings, help to direct and activate cognitive learning processes and critical thinking [11]. Cognitive tools aid in knowledge creation rather than knowledge replication. The learners' knowledge represents their grasp and conception of the content. For example, when students construct knowledge bases using databases, they must assess the subject area and participate in critical thinking.

There is a relevance of interpretation in cognition and learning. The Interpretation Creation Design (ICON) and Study Supported Environments (SSEs) are built on constructivist design ideas focused primarily on the interpretative construction of real objects in the context of rich background resources, covering several disciplines of study [16]. It was found that students were able to develop argumentation and reasoning abilities in addition to learning specific content. In sixth-grade ancient history class, a program called Archaeotype was utilized to show pupils a visual depiction of an archaeological site. Students who worked in groups had to dig out objects through simulation, examine and measure them in virtual laboratories, and eventually arrive at an understanding of the concepts underpinning what they were doing through interpretation and debate. A follow-up evaluation research discovered that students who participated in the study made considerable increases in their interpretive and argumentative abilities when compared to a control group [16].

Constructivists also emphasize reflective thinking, which necessitates careful consideration [12] [14] [17]. The importance of metacognition, or self-monitoring and self-control of the learning process is given utmost importance by constructivists. In this scenario, knowledge is added to prior representations, altering them in the process. External scaffolding in the shape of people, books, or technology such as computers is frequently required for teachers to employ reflective thinking to evaluate their technology use [14]. They emphasize the significance of documenting reflective thoughts to identify the quantity and quality of personal versus instructional technology usage, as well as the planning and execution of settings and activities. Technological instruments are "intellectual partners" and "strong catalysts" in the learning process, "scaffolding the all-important processes of articulation and reflection, which are the basis of knowledge formation" [11].

### **2.3 The Role of the Teacher in Technology Enhanced Environments**

In a constructivist framework, the teacher's function as a facilitator is the main focal point [18]. The instructor creates social and intellectual climates in constructivist classrooms that encourage collaborative and cooperative learning approaches. Concurrently, technology-enhanced classrooms employ constructivist methodologies [13] structuring problem-based projects in which students actively create knowledge, connecting previously known knowledge with new knowledge.

The role and responsibilities of the instructor have shifted in non-traditional classrooms such as the open/global classroom [17] [18]. As an agent, the teacher must continually update knowledge and technology to make learning real and current. It was critical to mix different theories such as constructivism, postmodernism, situated intelligence, and multiple intelligences while constructing a course module for teachers and taxonomy for teaching skills in the use of educational multimedia [18]. The theoretical framework, on the other hand, would be constructivist in nature, with the teacher acting as a facilitator, providing an environment for spontaneous research, understanding the social and collaborative nature of learning, assisting children in the construction of knowledge, and initiating problem-based, project-oriented work. There are new teacher competencies in constructivist contexts, including supervisor qualifications, supporter and facilitator of students' work, advisor and subject-matter expert, inspirer and encourager, arbiter at group discussions, critic in mobilizing greater effort when objectives are not met, and evaluator to improve student's general learning capacities [18].

### 3. Implications for Educators

Studies have found out that teachers' planning consistent with constructivist methods was very varied, with most pre-service teachers understanding very little about successful technology integration in education [19]. Because instructors prefer to teach what they were taught, both pre-service and in-service teachers must be exposed to constructivist-based education, which will allow them to create teaching practices that are congruent with modern educational developments [19]. Exposure to constructivist teaching approaches and concurrent multimedia learning experiences enhances constructivist behavior planning and technology integration [19].

There should be no confusion about the importance of the teacher when discussing the function of the teacher in constructivist paradigms. Nonetheless, many professors are concerned about the absence of well-defined material and the movement of locus of control to the learners [6] [7]. Creating appropriate contexts entails not only providing learners with resources and allowing them to discover things for themselves but also organizing resources in such a way that cognitive dissonances arise in the minds of the learners, inspiring them to learn how to learn through a collaborative and defensible understandings process [7].

The instructor is not ineffective or on the sidelines as a facilitator of learning. On the contrary, the instructor is free to employ several constructivist tactics to assist each learner, such as coaching, modeling, and scaffolding [20]. Support from other people and artifacts, as well as the cultural background and history that the learners bring to the setting, may all be considered scaffolding. Scaffolding, on the other hand, does not imply leading and instructing a learner toward a specific goal, but rather assisting the learner's progress through cognitive and metacognitive tasks [21]. As a result, the instructor takes on the role of a coach, ensuring mutual comprehension of the learner's points of view. When employing collaborative and cooperative groups, teachers must be careful to ensure that they are more than just learning tools, but also means to encourage dialogical exchange and reflexivity [7]

Technology may also have an impact on teaching practice to embrace constructivist concepts. As the quantity of technology access, the degree of technical abilities of instructors, and the usage of technology rose, so did the use of constructivist tactics in the classroom. Technology can provide the vehicle for accomplishing constructivist teaching practices. Thus, boosting teachers' computer skill levels and giving extra chances for instructors to integrate technology into classes may enhance the usage of constructivist practices. [22].

However, availability, skill level, and utilization do not ensure either meaningful use of technology or constructivist principles. It was found that many teachers focused on drill and practice software, ignoring basic computer skill development, or dealt exclusively with presentation skills and Internet resources. These academics advocated for an emphasis on staff development and training in technology usage, as well as constructivist techniques that went beyond reading skills to address application and curricular integration concerns [22].

### 4. Summary and Conclusion

According to constructivist viewpoints, learning is the active process of creating knowledge rather than passively obtaining knowledge, and teaching is the process of supporting the knowledge built by the learners rather than just communicating knowledge [7] [8] [13]. The viability of the learners' understanding of the real world determines truth, and viability is culturally determined. The constructivist framework tries to comprehend many points of view and challenges learners' thinking [7] [23]. It investigates the social roots of constructs, seeing learning as an acculturation process. As a result, the study of social and cultural processes and artifacts becomes a priority.



Technology may play an important role in the learning environment when the focus shifts from the objectivist to the constructivist context domain. “The richness of the technology permits us to provide a richer and more exciting (entertaining) learning environment... our concern is the new understandings and new capabilities that are possible through the use of technology [7]. Creating appropriate contexts entails not only providing resources and allowing learners to discover things for themselves, but also organizing resources in such a way that cognitive dissonances arise in the learners' minds, inspiring them to learn how to learn through a collaborative and defensible understandings process. It is not fair to see technology instruments and tools as a solution for all of the challenges that instructors and students encounter, and it is critical to recognize the significance of conventional teaching devices and instruments. It should be emphasized that technology is only one tool for supporting teachers. Technology and a constructivist approach do not have to be incompatible or fully interdependent. If we shift our perception of computers from solely a method of delivering teaching to one of a tool for problem-solving, the reform movement may influence the use of technology, and technology may influence education reform.

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