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# Designing a Connectivist Flipped Classroom Platform Using Unified Modeling Language

Chih-Feng Chien, Chung Yuan Christian University, Taoyuan City, Taiwan
Gary Yu-Hsin Chen, National Kaohsiung University of Science and Technology, Kaohsiung City, Taiwan
Ching-Jung Liao, Chung Yuan Christian University, Taoyuan City, Taiwan

## ABSTRACT

By using unified modeling language (UML), the researchers design a cloud-based video discussion platform, named Flipnote, for students to ask questions at any point in an instructional video. Based on the digital learning theory of connectivism, knowledge is generated by mass discussion and experience sharing via a social network. The purpose of this study is to administer a pilot study to explore students' experience and outcome of using Flipnote. The results demonstrate that the four dimensions (e.g., diversity, openness, interactivity, and autonomy) of the connectivism model play important roles for the first half of the flipped class, which is the preview at home. However, more empirical research and data are needed to validate the parts played by cognitivism and constructivism in the flipped classroom.

## KEYWORDS

Cognitivism, Connectivism, Constructivism, Flipped Classroom, Unified Modeling Language (UML)

## INTRODUCTION

Because many studies and scholars have argued that students have difficulty learning through collaboration and critical thinking in the teacher-centered learning environment (Oblinger, 2003), several strategies of student-centered learning have been proposed. For example, Merriam (2015) proposes concentrating on specific fields of interest to students for 100 hours per year. Gray and Madson (2007) advocate that active and collaborative learning can stimulate students' thinking and make learning more interesting. Self-paced learning (Canestrari, 1963) and self-directed learning (Hiemstra, 1994) have long been proposed for current students of generation Y to engage in more interactive learning. Among many student-centered learning strategies, one of the most prevalent teaching strategies—flipped teaching—has been implemented and studied to a great extent.

In a flipped classroom, the instructor records lecture videos for students to preview so as to master the basic content at home prior to attending class. In the classroom, students participate in group activities and discussion with teachers and classmates and practice high-level thinking through

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collaboration, reasoning, presentation, and discussion. The strength of the flipped classroom is that it allows individuals to repeat and review course content in their own time and to concentrate on student-centered learning at school (e.g., collaborative problem solving, group discussion and presentation) (Mason, Shuman, & Cook, 2013). The strength of flipped learning, different from traditional classroom lectures, is that it promotes self-paced and self-directed learning in which the instructor acts as a monitor, facilitator, feedback provider, and coach. Overall, flipped teaching seems flawless for encouraging students to learn by themselves and interact with teachers and counterparts.

The flipped classroom shows potential success, but it has some weaknesses. One of the biggest limitations of the flipped classroom is that when students watch videos at home, they cannot ask questions or interact with peers or teachers instantaneously (Bhagat, Chang, & Chang, 2016). The execution of flipped classrooms demands that students jot down their problems while at home and bring them to class (Fautch, 2015). However, many cases have shown that students tend to forget the problems they encounter in the videos or cannot ask exact questions to clarify their understanding. This situation is worst in the fields of mathematics, engineering, and natural sciences due to the difficulty in describing problems through text. These communication challenges result in heightened unwillingness to raise questions and interact in the flipped classroom.

Therefore, this study integrates connectivism theory (Siemens, 2005), which focuses on aggregating necessary knowledge through a network connection, rather than learning all knowledge on one's own. By adopting digital technology and an interactive network in the flipped classroom, this research develops a video annotation platform named Flipnote. Flipnote is designed to support interaction in the flipped classroom when it comes to viewing video lectures at home. Flipnote incorporates a variety of communication features, such as raising questions via typing, drawing, picture uploading, and voice typing. Students can share their questions to popular social network sites such as Facebook, Line, and Twitter. In a familiar environment, students can easily communicate through asynchronous online discussion. After the peer discussions, an instructor can then wind up the class activities with a proper conclusion.

To analyze learners' needs for a cloud-based video discussion platform, the researchers adopt Unified Modeling Language (UML), particularly the "use case diagram," to investigate the essential functionalities required in a flipped classroom. UML is a communication standard for describing systematic requirements in the analysis and design process. Through visual diagrams, UML can clearly narrate operational scenarios present in information technology (IT) systems including flipped class learning platforms (Wong et al., 2002).

Use cases in a use case diagram are valuable and easily understandable for all stakeholders because unlike most system analysis tools that emphasize capturing system requirements from the system's perspective, use cases specifically focus on the needs and interactions of users, in this case students (Bennett, McRobb, & Farmer, 2010). By analyzing users' needs through use cases, potentially missing or incomplete user requirements can be identified in video platforms such as the Microsoft Research Annotation System (MRAS) to improve and enhance the system's functionalities.

This research is intended (1) to apply UML to design a video annotation platform—Flipnote, (2) to administer a pilot study at a local high school, and (3) to apply connectivism theory to explore students' experiences and outcomes of using Flipnote.

## LITERATURE REVIEW

The study incorporates connectivism theory as the theoretical framework, focusing on gaining knowledge through online interaction among learners. Additionally, the study intends to utilize UML, a developmental modeling approach to visualize the design of software. Based on connectivism theory, the purpose is to design a video annotation platform, Flipnote, to support a flipped classroom. The concept of the study comes from students' knowledge and experience, as well as online discussion and

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