Use of Online Educational Videos for Concept-oriented Peer-based Learning

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Abstract

Researchers have always studied the use of non-traditional and novel electronic methods in teaching, including web-based modalities. According to existing literature, educational videos are increasingly used in education, and students can learn complex concepts much better when presented with visual explanatory videos. Additionally, researchers have studied the use of educational videos in students' self-regulated learning, motivation, and engagement. Web 2.0 applications, such as the online video platform YouTube, may enhance the students' knowledge and retention while connecting with peers and faculty. However, the availability of this immense variety of online videos poses problems when picking out the relevant, updated, and appropriate ones for educational purposes. Additionally, the absence of instructors' support may introduce irrelevant concepts and affect the students' existing conceptual knowledge. In this paper, we present a concept-oriented peer-based learning framework (COPL). This learning framework helps students improve their learning and increase their motivation and engagement. The proposed framework is based on the Feynman technique or mental model, summarised in the following statement "If you want to learn something properly, try to explain it clearly." By trying to teach a concept in plain terms, students will immediately see where they understand that concept. They will also be able to identify gaps in their conceptual knowledge instantly. The proposed framework steps are (i) Instructor identifies the learning objectives, (ii) instructor determines related concepts and defines assessment metrics, (iii) students use the Feynman technique to create videos explaining these concepts and can provide constructive feedback on peers' videos, and finally, (iv) instructor moderates the content and assigns digital badges, as incentives, to students based on their interactions and engagement. Our study contributions: (i) a new framework that supports the students' learning, engagement, and motivation supported by the activity and motivation theories, (ii) a web-based cyber-environment that fosters peer-based learning, collaboration, and interaction, (iii) a fruitful approach to educational data collection and analysis, and (iv) an insight for researchers and faculty members on how the students form a community of learners to extend their collective knowledge through the video-based co-explanation of various concepts.

Keywords: *Educational online videos, self-regulated learning, peer-based learning, student engagement, student motivation.*

1. Introduction

A concept-oriented peer-based learning framework (COPL) is presented in this work. The framework aims to increase the students’ motivation and engagement. Video-based learning is being used more and more since video explanations of complex concepts can help students learn more effectively [1]. Researchers have also examined the effect of educational videos on students' motivation, awareness, and engagement [2]. By providing students with access to online video platforms, such as YouTube, they can increase their knowledge and retention [3]. Despite the abundance of online videos available, it can be challenging to determine which ones are relevant, updated, and appropriate to use in education. Furthermore, the absence of instructors' support means that students can be introduced to irrelevant ideas and negatively affect their knowledge. In this work, we are trying to fill in this gap by utilizing the COPL framework within our new system. By providing an enclosed system with content created by the community of students and moderated by instructors, we believe this approach will make the classes more motivational and significantly reduce face-to-face students' lecturing. This environment will suit distance learning, improve self-regulated learning, and encourage discussions and cooperative peer-based learning. In the following sections, we will present related work, a discussion of the proposed methodology, system overview and components, and finally, the conclusions and future work.

2. Related work

In [1], researchers studied the use of YouTube videos to enhance students' learning. The study results have shown that students can remember complex concepts much better when exposed to a visual explanation video. In another study [4], researchers examined the use of self-made YouTube videos by lecturers in teaching mathematics. Results confirmed that students use YouTube regularly and showed that they preferred videos created by their lecturers to videos on the Internet. Another work [5] investigated the video selection approach's appropriateness, and results showed that videos posted on YouTube could lack the potential to address mixed ability students and have fewer objectives. Audience retention is a timeline-based data source representing the share of users watching a particular point in a video over its duration. Researchers in another study [6] found that lecturers can use educational videos as a new tool to increase students' motivation. These videos existed on the university's teaching platform (based on Moodle) or were available through YouTube channels. Online video platforms have been the central focus of several studies interested in self-regulated learning. In one study [7], students created videos to explain solutions to challenging calculus exercises. Students' surveys suggest that a significantly higher level of self-regulated learning occurs in making these videos than in completing traditional written or online homework. In another study [8], researchers compared the impact of interactive and non-interactive video on students' learning. Results showed that students who have control of the video movement and can move freely to the most important or interesting sections have higher satisfaction and achievement of learning outcomes. Another research work [14], studied instructor stylistics and their use of figurative language in online YouTube videos. Results showed variations accross various computer science topics and found that student engagement metrics like the number of likes are positively correlated and that the sentiment polarity of students' comments is correlated with the number of likes.

3. Methodology

The COPL framework consists of four main steps, summarized in fig. 1. The COPL framework follows the motivation and activity learning theories. We discuss motivation as being intrinsic or extrinsic. Intrinsically motivated behaviors are performed because of the sense of personal satisfaction they bring, while extrinsically motivated behaviors are performed to receive something from others. Our motivations are often a mix of intrinsic and extrinsic factors, but the nature of the combination of these factors might change over time. Using the implemented system with the COPL framework, students can experience intrinsic motivation when they feel a sense of belonging and some control over the learning environment by taking the role of the instructor in creating educational videos for their peers. Furthermore, assigning students topics and related concepts that are challenging yet doable and easy to explain, along with a rationale for engaging in various learning activities, can enhance their intrinsic motivation [9]. Verbal praise in the video comments by the instructor and other students might increase intrinsic motivation [10]. Using COPL, intrinsic and extrinsic motivation can be achieved by assigning digital badges to students based on their contributions and learning goals. A study revealed that badges impact both intrinsic and extrinsic motivation and that the effects of badges differ based on the learner's ability, prior knowledge level, and badge design [11]. Other researchers found that badges increased student interaction and can be more useful in online courses [12]. Engeström's Activity Theory [13] was one of the bases for the COPL framework. Engeström's approach explained human thought processes based on the individual's social interactions with the external world through artifacts, specifically in situations where activities were being produced. Through the implemented system, students can interact with each other and the instructor. Interactions will be mediated by the implemented system and influenced by the comments, digital badges, and the number of likes. Instructors should ensure that students' videos are relevant and that others are engaged and responding appropriately to help the entire community of learners to extend their collective knowledge.

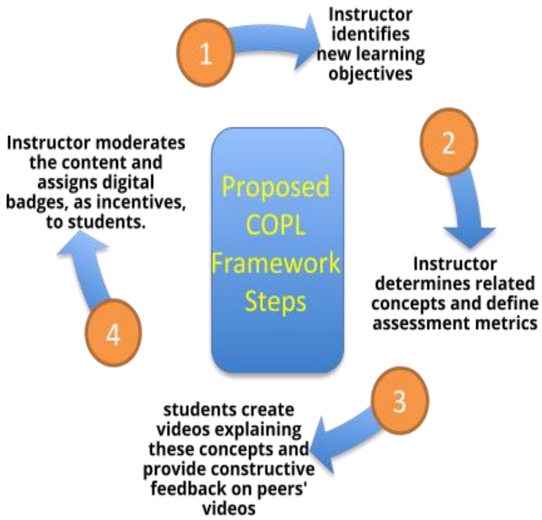


Fig. 1. The COPL framework's main steps.

4. System Overview

The implemented system utilizes a coordinating architecture that serves as a multiplexer for various components (Fig. 2). It consists of a web-based user interface, a database (contains students' profile data, educational videos, students' interactions), learning analytics tools, and a resource manager (connects the system to computing resources including Amazon and Google web services and learning management systems including Canvas). The vision behind this architecture is to make the system self-sustainable, where students and educators can contribute new videos and learning resources. In addition, the design helps the system be self-manageable as it hides the complexities of resource allocation, scheduling, cross-platform interactions, and other low-level concerns from end-users.

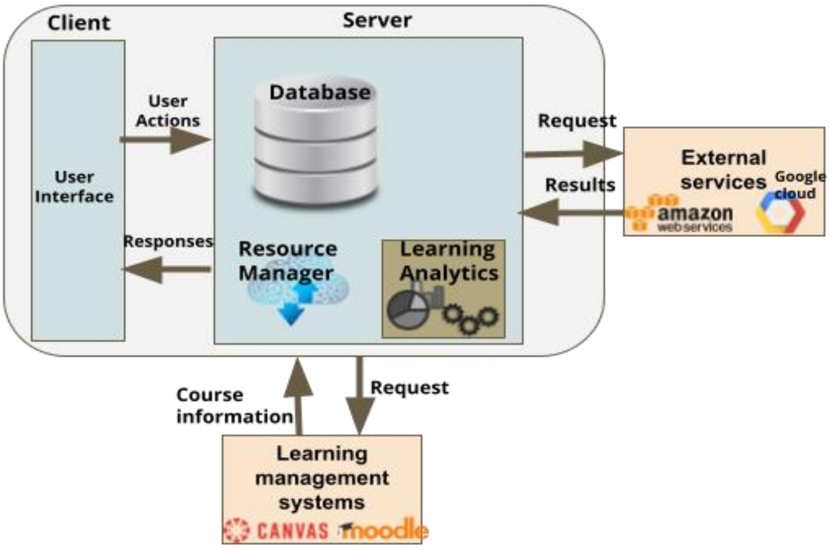
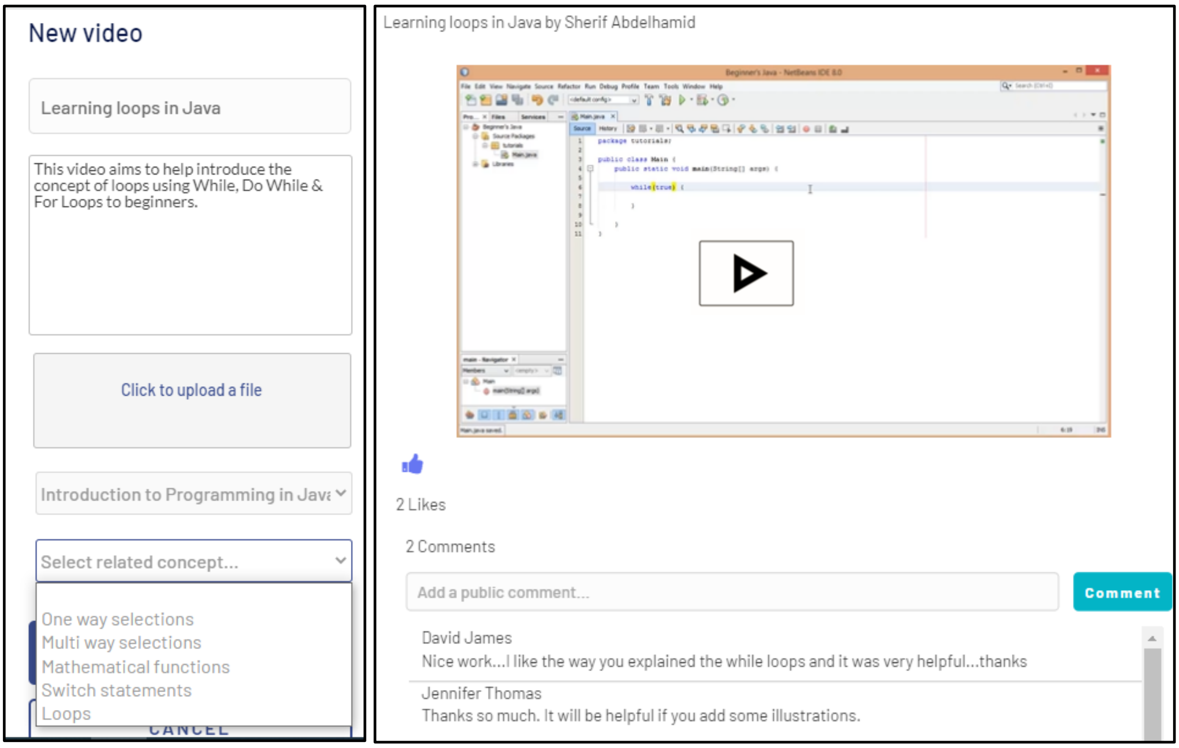


Fig 2. The Implemented system multi-tier architecture.

The system includes an interactive web-based interface that serves users with various access rights, including students, instructors, and admin users. One of the interface design goals is to enhance the students' experience and make their journey through the system as easy and usable as possible. The system provides the capability for students to create and share educational videos and learning resources with other students (Fig. 3.a). Instructors or admin users can moderate the uploaded videos. Students can comment and provide constructive feedback on their peers' videos and use the like button to show support, as shown in fig. 3.b. Instructors have a special screen to add new topics and define related concepts. Additionally, the admin user can monitor and block content if needed.



(a) (b)

Fig 3. The web-based interface has various screens that serve different functionalities, including (a) student creating and sharing educational videos to explain concepts created by instructors and (b) viewing and providing constructive feedback on peers' videos.

5. Conclusion and Future Work

We have described the COPL framework that aims to help improve the students' engagement and motivation. COPL will help the students be directly involved in enhancing the learning process. This pedagogical approach is described as a "Students as Partners" approach where students form a community of learners to extend their collective knowledge through the video-based co-explanation of various concepts. While educational videos are progressively becoming more commonplace in various classroom settings, the large and diverse catalogs of websites can present an issue of irrelevant, inaccurate, or inappropriate concepts. The COPL framework through the implemented system, students can utilize the benefits of educational videos within a safe and engaging environment. Furthermore, through intrinsic and extrinsic motivators induced in the COPL framework, instructors can further the students' educational success while accurately gauging a student's current knowledge regarding a given topic. Our future work will involve the integration of the COPL framework and system in an undergraduate course within the computer science department. Additionally, we will collect and analyze data related to students' motivation and engagement through surveys and interviews.

References

[1] Chtouki, Yousra, et al. "The impact of YouTube videos on the student's learning." 2012 international conference on information technology-based higher education and training (ITHET). IEEE, (2012).

[2] Morena, Matthew A., Shelly Smith, and Robert Talbert. "Video made the calculus star." PRIMUS 29.1 (2019): 43-55.

[3] Oktavia, Tanty, et al. "The influence of social media to support learning process in higher education institution: A survey perspective." 2017 ICISS. IEEE (2017).

[4] Faye, Ibrahima. "Students' perception in the use of self-made YouTube videos in teaching Mathematics." 2014 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE). IEEE (2014).
[5] Appavoo, Perienen, et al. "Confused which educational video to choose? Appropriateness of YouTube videos for instructional purposes-making the right choice." International Conference on Computing, Communication and Security (ICCCS). IEEE (2015).
[6] Bravo, Edna, et al. "Video as a new teaching tool to increase student motivation." 2011 IEEE global engineering education conference (EDUCON). IEEE (2011).
[7] Morena, Matthew A., Shelly Smith, and Robert Talbert. "Video made the calculus star." PRIMUS 29.1 (2019).
[8] Zhang, Dongsong, et al. "Instructional video in e-learning: Assessing the impact of interactive video on learning effectiveness." Information & management 43.1 (2006).
[9] Niemiec, C. P., & Ryan, R. M. Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. Theory and research in Education, 7(2), 133-144 (2009).
[10] Cameron, J., & Pierce, W. D. Reinforcement, reward, and intrinsic motivation: A meta-analysis. Review of Educational research, 64(3), 363-423 (1994).
[11] Abramovich, S., Schunn, C., & Higashi, R. M. Are badges useful in education? It depends upon the type of badge and expertise of learner. Educational Technology Research and Development, 61(2), 217-232 (2013).
[12] Wilson, B. G., Gasell, C., Ozyer, A., & Scrogan, L. Adopting digital badges in higher education: Scoping the territory. In Foundation of digital badges and micro-credentials (pp. 163-177), Springer (2016).
[13] Brown, J. S., Heath, C., & Pea, R. Perspectives on activity theory. Cambridge university press (1999).
[14] Abdelhamid, S., & Katz, A. Figurative Language in Computer Education: Evidence from YouTube Instructional Videos. In 2021 ASEE Virtual Annual Conference (2021).