CS6460 Educational Technology: Self-explanation collaborative tool

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***Abstract*— One of the main challenges educational institutions face is keeping students engaged during online classes. Self-explanatory techniques show some efficiency in keeping students engaged. But, there are still rooms for improvement to get students more motivated and contribute toward the evolution of system content. This paper summarizes the existing self-explanatory method and presents a designed solution to extend it as a collaborative platform.

The tool is an extension plugin that universities and educational platforms can integrate into their existing solutions. This paper defines the tool's integration and how it improves student engagement.

1 INTRODUCTION

Remote learning becomes an established part of the global educational system and enforced due to the covid-19 pandemic. Many tools were introduced to support the eLearning evolution, but still, there are many improvements and tools to develop and enhance students' experience.

Many universities use the web and mobile-based applications to guide students through a passive communication flow that requires them to lead their schedules and succeed in the classes.

Unfortunately, recent reports show that more students are failing due to the improper use of virtual learning systems. Lack of motivation and discipline leads many students to fail. (Consilz Tan,2020).

Therefore, the need for assistance tools may add value to the educational program and help students succeed in their studies. The existing educational tools

provide a set of techniques like self-explanatory where students are required to explain the problem-solving and provide feedback to confirm their understating. (Chi, M. T. H., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1989)).

Even though the traditional self-explanatory helps students to easily understand the content of the material but still isn't addressing the engagement concerns regarding motivation and disciple, and improving the self-explanatory process helps students to foster their learning.(Renkl, A., Stark, R., Gruber, H., & Mandl, H. (1998)). This improvement shall start with combining the worked example with the self-explanatory techniques as stated by (Crippen, Kent J ; Earl, Boyd L (2007)) and (Riyadh Alhassan. (2017))that the combination of worked examples and self-explanatory on web-based solutions shows that the student learning and motivation dramatically improved.

My proposal comes into the picture to design the worked-based example self-explanatory collaborative system. It shall involve the educational community to contribute and support each other to learn and succeed. This involvement creates a motivational environment as it rewards contributors.

Also, this system shall mimic the on-campus study where students support each other and re-enforce the collaboration practices.

2 RELATED WORK

I selected and reviewed many academic and industrial tools and considered their research data to enhance my proposal.

The Learning by doing and explaining with a computer-based cognitive tutor technique ((Vincent AWMM Aleven and Kenneth R Koedinger 2002) supports students' engagement in the class using intelligent instructional software that guides learning by doing. It is concluded within this study that self-explanatory shows efficiency in improving the learning where students are required to explain their problem-solving steps, provide feedback to confirm their understanding using an orientation solution.

In Adaptively increasing abstraction techniques, they found many challenges when integrating the self-explanatory in the game due to the high cognitive load that complex games require. (Douglas B. Clark, Satyugjit S. Virk, Jackie Barnes, Deanne M. Adam 2016).

The “floopedu.com” is an industrial cloud-based software that students use to get teacher and peers feedback on uploaded assignments. This solution illustrates the benefits of getting feedback from peers and teachers rather than the mono verification on content.

“Goboard.com” is a one-on-one collaborative tool that helps students to interact through the shared session. This solution is not driven to enhance the engagement rather that provide a method to communicate within students.

“Tutor.com“ is a tutoring company that connects students to teachers as a paid service.

Considering the existing educational tools and their contribution volume to online education, we could see that each tool resolves a specific problem. Some are helping the user to contribute through a social network, others encourage people to provide tutoring services and use self-explanatory services.

These are solutions that are monolithic and focus on a single service problem. Therefore, the goal of my project is to design a multi-function tool that re-implements the self-explanatory techniques and encourages students to contribute to the platform.

3 THE SOLUTION

The collaborative self-explanatory tool is implemented on a worked examples database that students use to understand the class's material. This database shall be developed through students' collective contributions that reward participants and keep the accreditation of the system content.

The collaborative self-explanatory tool implements a worked examples database. This database grows through students' collective contributions that reward participants and keep the accreditation of the system content.

The tools is composed of three main complements :

- The application service: It provides interfaces to interact with the tool engine, save and collect data.
- The application client: This provides interfaces for user operations.
- Action module: This constitutes the entry point to call the application client service. It does define the requirement integrator has to follow.

The tool manages different profiles as a university teacher, external teacher (Teacher Assistant), student, and Admin. Each profile has defined operations based on roles specification.

3.1 Tool description

This project version of the tool shall be a web-based application designed as an integrated framework and accessed through an action button below the educational content. The content is either a video or graphic (Document or Text).

When the student clicks on the action button, a modal window shows up to first authenticate then recognize the profile type to define the type of operations the user can perform.

Based on the system profiles definition, the user either can add self-explanatory worked example, view an existing one, claim rewards, see profile or add users.

The self-explanation worked examples are set by contributors who submitted them into the database through the tool UI. Students shall view the self-explanatory examples if they exist for selected content.

If no example shows up, a notification email is sent to students or teachers to request support.

The same logic applies to the video content, except users can see many examples based on the timestamp they selected.

Contributors shall get rewards for their example submissions and transfer them to their wallets.

3.2 System profiles

- **Teacher :** The teacher shall add self-explanatory worked examples and validate contributors' inputs. Grant validation role to the assistant teacher. Add users.
  - **Assistant Teacher (ET) :** The teacher shall add self-explanatory worked examples and validate contributors' inputs. Permit validation role to the assistant teacher. Add users.
- **Student :**

- **Learner / Contributor:** Learn, Contribute and get rewards.

- **Admin :** Superuser role that manages user's access to the system.

3.3 User Interface flows

The tool shall be integrated by universities or online educational platforms as an action button below the material's content. (Refer to Figure 1)

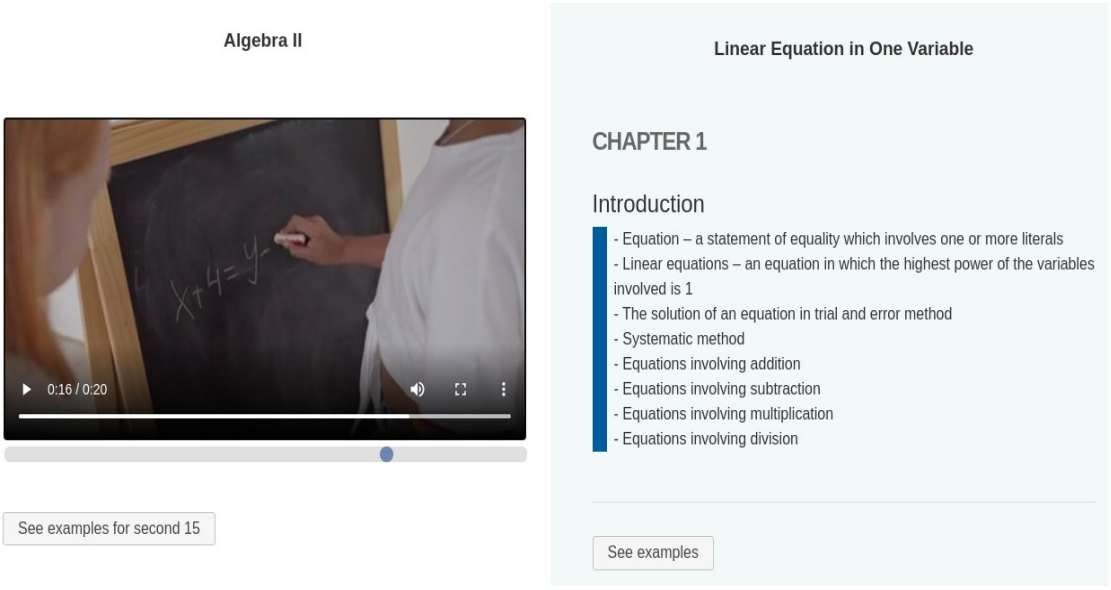

Figure 1 – An example of the tool integration

If a user clicks on the button, an authentication screen shall show up. When the user logged in, he can either access to the existing self-explanatory examples, insert a self-explanatory example screen, check his reward, or access the admin screen. (Refer to Figure 2,3)

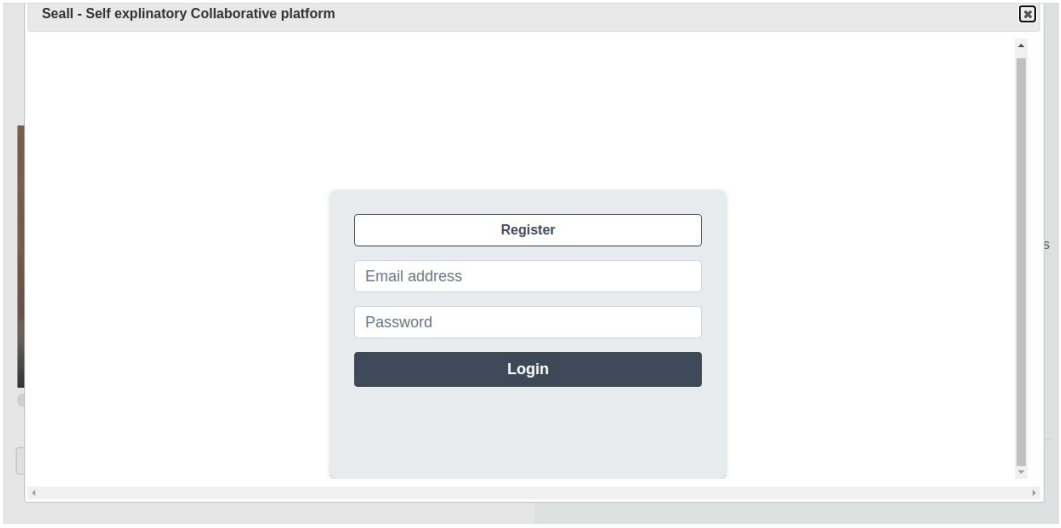

Figure 2 – Authentication method

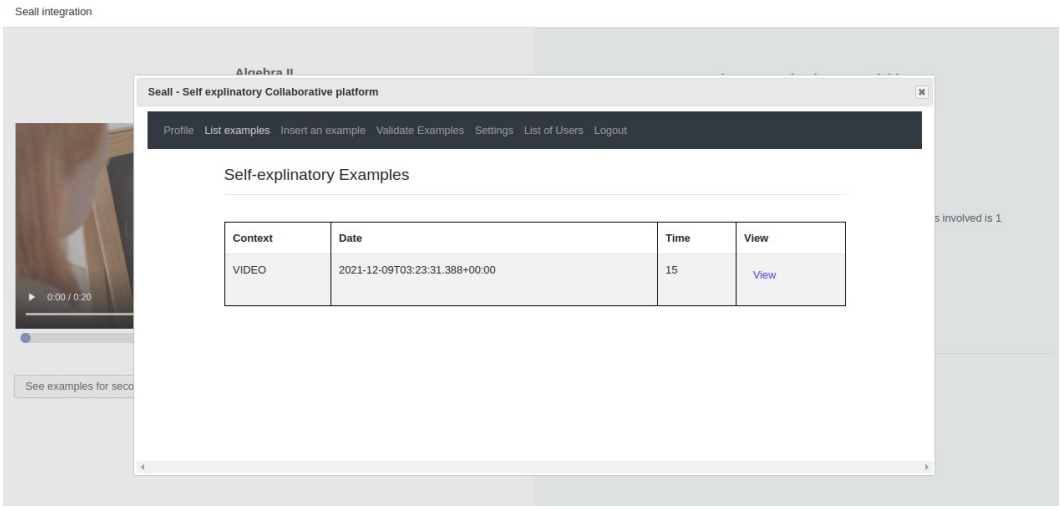

Figure 3 – Examples list

When students select a worked example, another model window shows up a self-explanatory content. (Refer to Figure 4)

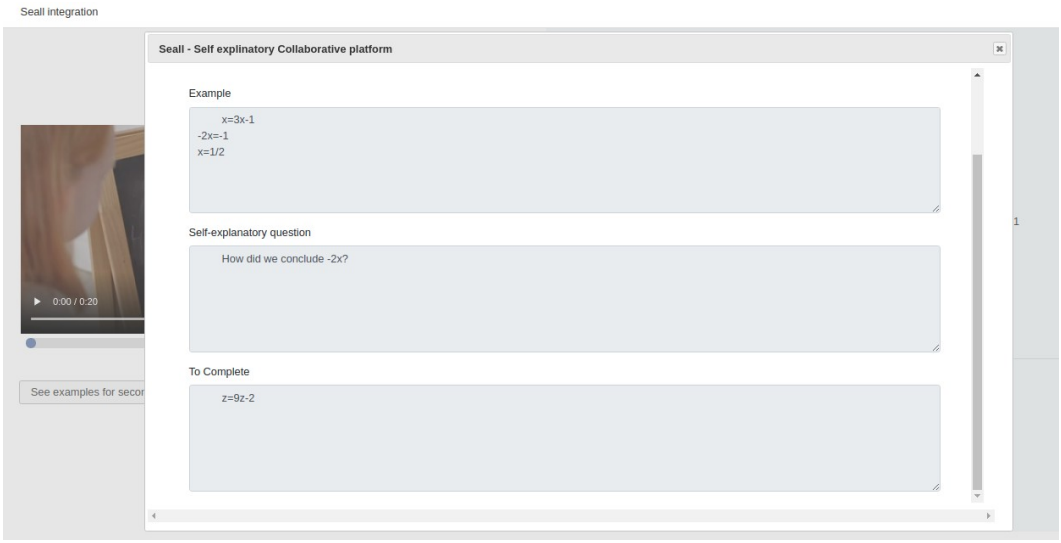

Figure 4 – View Example

Students can insert a new example and use help buttons for guidance. When saving the self-explanatory example, a notification email shall be sent to teachers to review and validate the content. (Refer to Figure 5)

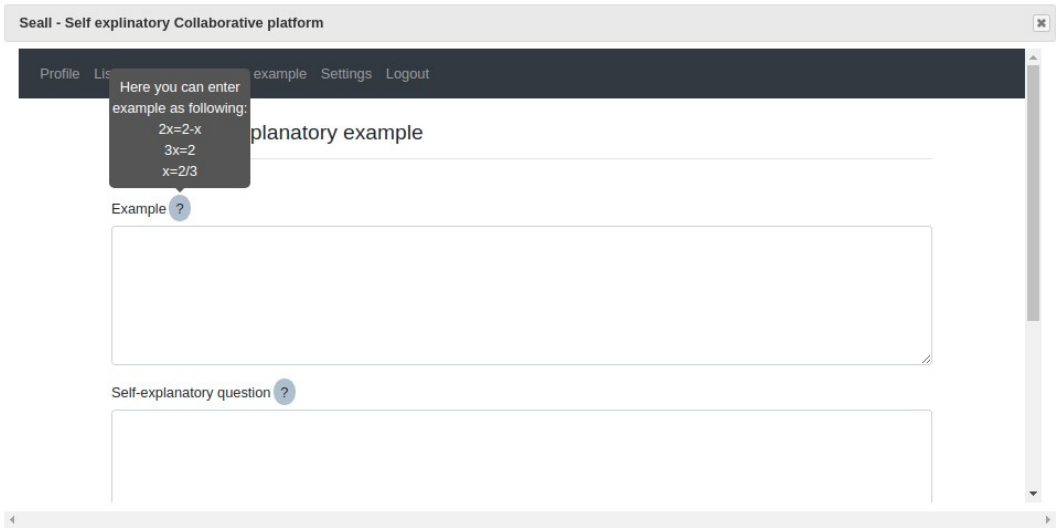

Figure 5 – Insert an Example

Contributors shall be able to transfer their collected points into their wallets. (Refer to Figure 6)

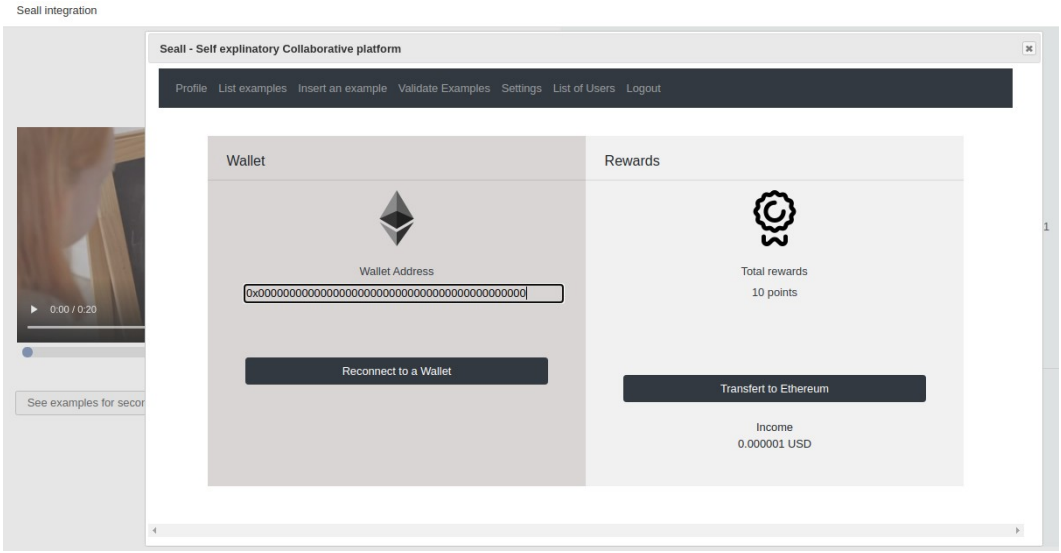

Figure 6 – Setting screen

3.4 System

The below diagram explains the system flows of the application from user inputs to background tasks.

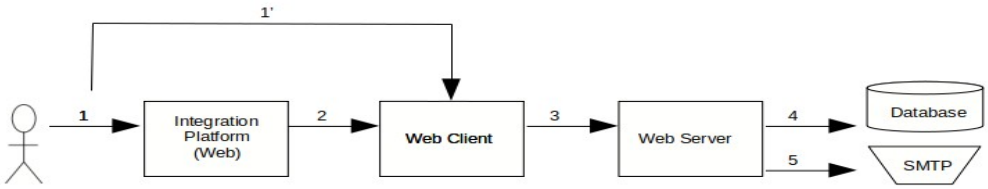

Figure 7 – Example flow

I. View an example

1: User profile (Student or teacher) clicks on the example button below the selected content. If it is graphical content then the integrator sends a link and content identification tag. These values represent the identification key of

the selected content. If it is video content, we shall add the timestamp to see the desired examples.

2: The client receives the examples search keys and displays the desired examples to the user. If no examples exist then we call the server to notify contributors.

3: The client app uses the server application to write into the database and send emails.

4: The server application is connected to the database and adds examples based on search criteria. It also connects to the SMTP server to send an email notification to teachers for validation.

II. Add an example

1 : User profile (Student or teacher) clicks on the example button below the selected content. If it is graphical content then the integrator sends a link and content identification tag. These values represent the identification key of the selected content. If it is video content, we shall add the timestamp to see the desired examples.

2 : The client receives the examples search keys to insert new examples.

3: The client app uses the server application to access the database and send emails.

4: The server application is connected to the database and gets the examples based on search criteria. It also connects to the SMTP server to send an email notification to contributors with a link and timestamp to facilitate their contribution.

III. Validate an example

1′: Teachers connect through the client application and validate examples.

3: The client app uses the server application to update the status of the example and move them from pending to validated.

4: The server application is connected to the database and executes the validation command.

In conclusion, the tool provides an accredited space of collaboration that students use to support the knowledge share and keep students motivated to contribute by getting rewarded.

4 METHODOLOGY

I shall evaluate the proposed tool in three-level environments.

- Development environment: Real-time verification during the implementation phase.
- Quality insurance environment: Involve other members to verify the beta version of the application.
- Production environment: The final version shall be released and published to the global audience. This verification phase is not intended for this project but shall be considered as the next step for project development.

5 THE RESULTS

The verification completed on the development and QA side concluded that having a shortcut method to collaborate with other peer content is an effective way to keep the student engaged and focused without direct interaction with others and using their worked examples for collaboration.
These results need to be re-evaluated when publishing the production version to the public.

6 LIMITATIONS

The tool requires continuous design, development sessions, and getting more audience feedback to enhance the user experience and see how it does improve a bigger audience.

7 CONCLUSION

Remote learning becomes an established part of the global educational system and was more enforced due to the covid-19 pandemic. Many tools have been developed to support the eLearning evolution, but still, there are many improvements and tools to develop and enhance the user experience.

Students are failing due to the improper use of eLearning systems. Lack of motivation, discipline leads many students to fail in the educational program.

To improve students' engagement, we proposed a collaborative self-explanatory tool designed based on a worked examples database that students can use to effectively engage in classes.

This database shall be developed through students' collective contributions that reward participants and keep the accreditation of the system content. This creates a solid method to motivate the student and keep them engaged.

These results need to be reevaluated when publishing the tool's production version to the public due to the project phase which constitutes an actual limitation.

8 FUTURE WORK

These are the intended future work to consider.

Redesign the user experience to make it more user-friendly and add extra features to facilitate users' operations.

Enable the monetizing system and link it to the existing user's wallet to start the system transactions.

These improvements shall be published into the first production version and continuous data collection shall be considered to evaluate users' engagement.

9 REFERENCES

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