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Integrating Explanations in Active Video Watching

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Abstract: Recent studies on Explainable Artificial Intelligence (XAI) in education show benefits for student learning. However, integrating XAI in AI-based education (AIED) systems requires understanding students' explanation needs. Some approaches to adding XAI to AIED systems include participatory design and co-design involving learners. This study presents a participatory approach to implement explanations in Active Video Watching (AVW). We designed explanations based on the requirements on timing and presentation of explanations and additional feedback from learners during the participatory activity. The implemented explanations support students who made low to medium-quality comments on video content by explaining how comment quality was determined. Furthermore, explanations included recommendations to improve future comments. We present the results of a pilot study on explanations in an AVW platform.

Keywords: Explanations, Comment Quality, Active Video Watching

1. Introduction

Providing explanations in Artificial Intelligence in Education (AIED) systems provides benefits to the learning process of students, such as increasing student agency, sensemaking and trust in the system or AI's decision (Khosravi et al. 2022). Clarke and Mitrovic (2024) showed that students using SQL-Tutor, an intelligent tutoring system that teaches students to write SQL queries, who received explanations tended to accept recommended problems from the system more often. Barria-Pineda and Brusilovsky's study (2019) showed that applying transparent recommendations and explanations to online educational systems led to higher confidence in attempting learning activities.

Despite the benefits of explanations in AIED systems, the integration of Explainable Artificial Intelligence (XAI) in educational systems has been comparatively low as compared with XAI's application in other areas, such as office assistants (Conati et al., 2020). This is also the case with Active Video Watching (AVW), a form of video-based learning. Current implementations of AVW systems integrate AI features, such as in analyzing students' comments on videos as a form of deeper student engagement. Mohammadhassan (2022) noted that assessing comment quality nudged students to write better comments and eventually improved student learning. However, students raised questions about how their comments were classified as either low or high quality (Mohammadhassan, 2022).

Khosravi et al. (2022) discuss different design approaches for adding explanations to AIED systems. *Participatory design* and *co-design* enable learners to take an active role in designing XAI. Therefore, we conducted a survey to identify what kind of explanations students would like to see in AVW. Based on the results of the survey, we implemented explanations in AVW to support students when making comments and reflecting on video-based learning material. An initial analysis of results from a current study on explanations in AVW also shows the utilization of the explanation features.

2. Explanations in AVW-Space

Our project is conducted in the context of AVW-Space, an AVW platform (Mohammadhassan et al., 2020). AVW-Space contains an AI component that categorizes comments into quality categories. Table 1 describes how comments are classified (Mohammadhassan et al. 2020). Categories 1 and 2 are defined as low quality, and 3 to 5 as high-quality. In recent studies with AVW-Space, learning interventions such as personalized prompts were given to students who made low-quality comments. Figure 1 (left) shows how the comment quality is shown to students. A color indicator and a label indicate the comment quality.

Table 1. *Quality Scheme for Comments in AVW*

	Category	Definition
1.	Affirmative, negative, off-topic	Irrelevant or merely affirmative/negative with no explanation.
2.	Repeating	Repeating the video content.
3.	Critical and analytical	Mentioning points that are implicitly covered in the video or show critical thinking on the content of the video.
4.	Reflective	Reflecting on one's behaviour and previous experience or knowledge.
5.	Regulating	Deciding on what one would do to improve oneself in the future.

We conducted a survey with three participant groups to identify the requirements for explanations in AVW. The first group of participants previously used AVW-Space to learn face-to-face communication skills as part of their coursework in SENG202, a second-year software engineering course at the University of Canterbury (UC). The second group were postgraduate students at UC. The third group were undergraduate students from the computing department of Ateneo de Davao University, who were new to AVW-Space. Five participants from the second group self-reported that they had prior experience with AVW-Space. Table 2 shows results on the desired timing and presentation for explanations of the AI feature in AVW.

Table 2. *Results for Timing and Presentation of Explanations for Comment Quality in AVW*

	With Prior AVW Experience		**New Users** (N = 82)	**Total** (N = 103)
	SENG202 Students (N = 16)	Others (N = 5)		
When would you like to see the explanation/s?				
Every time the comment is submitted	4	1	32	37 (35.9%)
On-Demand	12	4	50	66 (64.1%)
Where would you like to see these explanation/s?				
Within the comment list area	11	3	61	75 (72.8%)
As a pop-up window	5	2	21	28 (27.2%)

The majority of the participants, regardless of prior AVW experience, preferred on-demand explanations within the list of comments. Participants were also asked what improvements are needed in the platform. Six participants pointed out the need for clarifications or explanations of the comment quality. Some example comments were *"If the AI rating system could be clearer about why it gave the rating it did that would also be very helpful to improve future comments"* and *"With the rating the quality of your comments it would be cool to have something that says why your comments were of a low quality and what you could do to increase that quality."* Furthermore, when asked what participants were curious

about the AI feature in AVW-Space, 60 out of 103 responses were related to describing the general logic of the AI feature for categorizing comments, the key features that determine a comment quality, or examples for achieving a better comment quality.

Based on the survey findings, we designed the explanations as shown in Figure 1 (right). Explanations are on-demand and hidden by default. Students can show the explanation by clicking a button beside the comment quality label. The explanations differ between low/medium and high quality. As no support is further needed for students getting high-quality comments, a simple explanation is added (e.g., "*This comment is a quality 4 (high-quality) comment because you made a personal reflection related to [skill]*"). Meanwhile, for low and medium-quality comments, the explanation is divided into three parts: (1) an explanation of the comment quality, (2) a recommendation, and (3) an example of a better-quality comment. (see Figure 1 right).

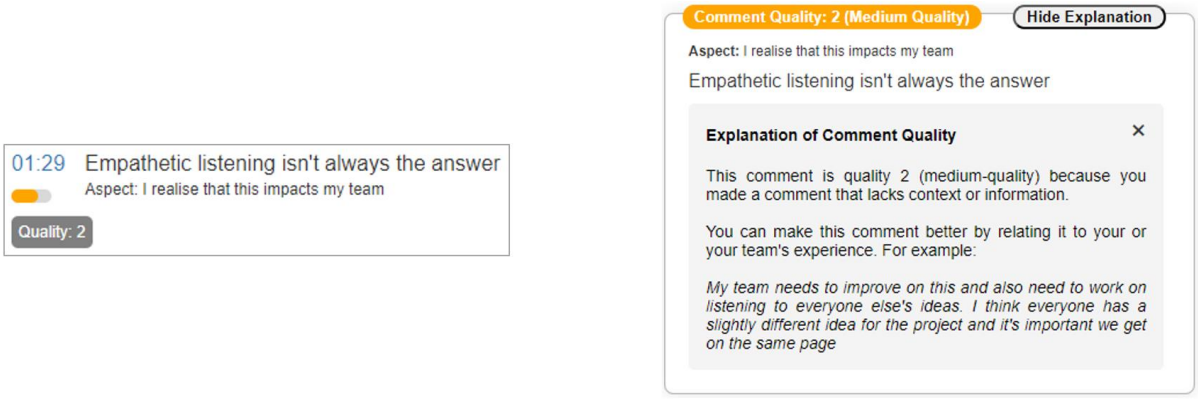

Figure 1: *Old comment layout in AVW-Space (left) and new comment layout with explanation and suggestion (right)*

In a study with the UC software engineering students, training them empathy skills, 94% (47 out of 50 students) who commented accessed explanations. On average, students access explanations 3 times during the course of the study. Also, students who got medium-quality comments tend to look at the explanations more often than those with only high-quality comments. 38% (19 students) accessed the explanation after making their first comment. 26% (13 students) accessed the same explanation multiple times, with five students looking at an earlier explanation after making multiple comments in the system.

3. Conclusions and Future Work

We have designed explanations in AVW based on the results of a survey on the timing and presentation of explanations. More than providing context to the decision of the AI system, explanations in AVW were designed to provide additional support to students and nudge them to make richer comments. Initial observations from the current study on the effects of explanations show that most students access explanations, although a more thorough investigation of the utilization of the explanation feature is necessary.

Further, we are currently assessing the effects of explanations on student learning and motivation, as well as assessing explanation satisfaction and trust. Future work will include eye-tracking studies to identify what students are interested in when reading explanations. Lastly, as this platform will be used for training soft skills to professionals, an investigation on the need for explanations between students and professionals will be conducted.

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