THE EFFECTIVENESS OF TEXT TRANSCRIPTION AND SUMMARIZATION ON STUDENTS' PERCEIVED LEARNING

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In recent years, the rapid advancement of educational technology has transformed the way knowledge is delivered, with recorded video lectures becoming a central component of online learning. While these formats provide flexibility and accessibility, they also pose challenges in content comprehension, accessibility and efficient revision. A key limitation lies in the sequential presentation of information, which can make processing content quickly a challenge.

This study examines the effectiveness of text transcription and summarization as tools to enhance learners' learning. We evaluated the usefulness of these learning materials on 47 learners from the School of Information Technology at Nanyang Polytechnic, analysing both quantitative and qualitative data through a survey consisting of open-ended questions and questions utilizing a Likert scale. A large majority of the learners agreed that the transcripts and summaries were useful for their learning. While both types of text were perceived as useful by learners, summaries were preferred over transcripts. The results indicate a higher mean and percentage of agreement for questions related to text summarization compared to text transcription. This preference is likely due to the comprehensive nature of transcripts, which convert all spoken content into text, making them lengthy and less effective in highlighting key points.

Some questions were designed to assess the effectiveness of text summarization on learners' perceived learning across different cognitive levels, and majority of the learners agreed that the summaries were useful in helping them achieve these cognitive levels. The respondents found the learning experience from text summarization beneficial, indicating a positive perception of learning and a sense of knowledge or skill acquisition.

These findings underscore the significant role of text transcription and summarization in fostering inclusive, efficient and effective online learning. Since not all learners absorb information the same way, some prefer auditory input, while others benefit more from visual or textual formats, the provision of transcripts and summaries is a multimodal approach that ensures no learner is left behind due to their preferred learning style.

Keywords: *Artificial Intelligence, video lecture, text transcription, text summarization*

Introduction

Online learning has led to a wealth of educational videos, providing learners with greater flexibility and accessibility. Nevertheless, these videos also pose challenges in terms of comprehension and the ability to efficiently review content. A key limitation lies in the sequential presentation of information, which can make processing content quickly a challenge. Furthermore, reviewing multiple videos before assessments can be time-intensive, particularly due to repeated segments. Transcribing and summarizing video content addresses these issues and offers significant benefits for students.

Transcriptions convert spoken content into written text, aiding auditory learners and those who struggle with the fast pace of lectures. They also cater to students with diverse learning styles, allowing them to alternate between reading and watching to enhance their understanding. Video lectures, however, can be lengthy, and extracting key points can be a time-consuming process. Research by Mayer and Moreno (1998) underscores the value of combining visual and auditory materials, with multi-modal learning environments now becoming the standard. The option to switch between modalities enhances comprehension and promotes knowledge retention. Additionally, Kushalnagar et al. (2013) found that students prefer transcripts over real-time captions for technical content, highlighting the practical benefits of transcriptions.

The extended length of video lectures often makes it difficult for students to efficiently identify key takeaways. Research by Geri et al. (2017), shows that online video lectures longer than 15 minutes experience a drop in completion rates, even when interactive features are incorporated. Text summarization addresses this issue by distilling lengthy content into concise and digestible summaries. These summaries allow students to quickly grasp essential information without spending excessive time, making them especially valuable for content-heavy subjects and focused revision. They also help reinforce understanding. According to Gonzalez et al. (2023), students who received summaries alongside lecture videos performed better than those who had

access only to the videos or the summaries alone. Qualitative feedback from the study further indicated that students preferred summaries when studying under time constraints, underscoring their role in enhancing the overall learning experience.

While studies have demonstrated the benefits of transcription and summaries, a crucial aspect to consider when exploring video transcription and summarization for educational purposes is their effectiveness. Specifically, this involves assessing students' perceived usefulness of these tools for learning and revising material in preparation for assessments and understanding how the effectiveness of summaries varies across domains.

While both transcripts and summaries are valuable tools for enhancing video-based learning, they serve distinct purposes and may appeal to different learner needs. Given these differences, it is important to compare their perceived usefulness and effectiveness from the learners' perspective. Understanding how students value each tool can inform educators on how best to integrate these resources into online learning environments. This comparison also helps identify which tool better supports specific learning goals, such as comprehension, review efficiency, and preparation for assessments. The rest of the paper is structured as follows: the next section describes the details of the course used in our experiment. Subsequently, we discuss dataset collection and the evaluation of the results. The paper concludes with a final section summarizing our findings.

Course Design and Methodology

The study focused on a course delivered to students enrolled in the Diploma in Applied AI & Analytics program at the School of Information Technology, Nanyang Polytechnic. The course was structured into two distinct Learning Units (LU): one for Year 1 students, which covered foundational statistics, and another for Year 2 students, which delved into machine learning concepts.

The course spanned a total of fifteen weeks, during which two tests were administered for each LU. To support students' revision, transcripts and summaries of all video lectures were provided three weeks in advance of each test. This approach aimed to enhance comprehension and facilitate efficient review of the material.

To evaluate the effectiveness of these tools, a quantitative research methodology was employed. Two distinct groups of learners participated in the study: 24 out of 69 students from the Year 1 Statistical Research Methods LU and 23 out of 61 students from the Year 2 Supervised Learning LU. Koh et al. (2010) studied response styles across cultures and found that Asians were more likely to give middle-scale ratings and less likely to select extreme options. Additionally, a 10-point scale allows respondents to express more nuanced opinions compared to shorter scales. Therefore, a survey was conducted using a Likert scale ranging from 1 to 10, where 1 indicated "strongly disagree" and 10 indicated "strongly agree." Responses were categorized such that scores of 6 or higher were considered agreement with the statement, while scores of 5 or lower were classified as disagreement.

Data analysis involved conducting an independent t-test to determine whether there was a statistically significant difference between the mean responses of the two groups. This approach allowed for a robust comparison of how students perceived the utility of text transcription and summarization across different academic levels and subject areas.

Results and Discussion

This study adopted a quantitative research design to investigate learners' perceptions of the usefulness of text transcription and summarization for video lectures. Data was collected through a survey administered to two groups of students enrolled in different units in the Diploma in Applied AI & Analytics. The survey measured perceived learning benefits using Likert-scale items aligned with Bloom's Taxonomy. A t-test was conducted to examine the mean differences in the survey questions between subject areas.

RQ1: To what extent does text transcription and the utility of text summarization affect learners' perceived learning?

The findings reveal that students found text summarization significantly more beneficial than text transcription for their learning and test preparation. Specifically, 77% of respondents agreed that transcripts were useful for preparing for tests, whereas an overwhelming 91% expressed similar sentiments toward text summaries. Furthermore, 72% of students reported feeling motivated to read the transcripts, compared to 87% who were motivated to engage with the summaries (Table 1). These results suggest that while both tools contributed positively to students' learning experiences, text summarization emerged as the more impactful resource.

While both types of text were perceived as useful by learners, summaries were preferred over transcripts. This preference is likely due to the comprehensive nature of transcripts, which convert all spoken content into text, making them lengthy and less effective in highlighting key points. Qualitative feedback from the survey further supports this observation. Two respondents specifically noted that the transcripts were too wordy, while one learner mentioned that the summaries occasionally lacked sufficient detail. Despite this critique, the consensus was clear: summaries offered a more efficient way in revising for tests.

These findings align with previous research highlighting the cognitive benefits of summarization in improving comprehension and retention. Summaries condense lengthy content into concise, digestible formats, enabling students to quickly grasp essential concepts - particularly in content-heavy subjects like statistics and machine learning. The higher agreement rates for summaries also underscore their potential as a

supplementary tool in educational settings, especially for students facing time constraints or struggling to extract critical information from dense materials. This provides valuable insights into how educators can optimize digital resources to support diverse learners effectively.

Table 1: Survey results difference between transcript and summaries

Survey Question S/N	Questions	Overall mean	% of Agreed	Type
1	The transcripts are helpful in my revision before the tests.	7.7	77%	Transcripts
2	The summaries are helpful in my revision before the tests	8.7	91%	Summaries
4	I am motivated to read the transcripts provided	7.6	72%	Transcripts
5	I am motivated to read the summaries provided	8.4	87%	Summaries

The concept of self-regulated learning (SRL) further supports our understanding of why summaries are so well-received by learners. As Code (2020) explains, SRL is supported by four dimensions of agency: intentionality, forethought, self-regulation, and self-efficacy. The availability of text transcriptions and summaries enhances flexibility, empowering students to take greater ownership of their learning pathways. This aligns with findings by Anderson and McGreal (2012), who emphasize that learners value flexibility and accessibility as key factors that enable them to control their educational journeys. By providing tools like summaries, educators can foster these dimensions of agency, helping students plan, monitor and evaluate their progress more effectively.

To assess the impact of text summarization on learners' cognitive development, four survey questions (Table 2) were designed to evaluate its effectiveness across different levels of Bloom's Taxonomy (Bloom et al., 1956): Remembering (Level 1), Understanding (Level 2), Applying (Level 3) and Analyzing (Level 4). Over 91% of learners agreed that the summaries were instrumental in helping them achieve these cognitive levels, with particularly strong agreement for Applying (Level 3). This indicates that summaries not only aid in foundational knowledge retention but also support higher-order thinking skills, such as applying concepts to practical scenarios. Majority of the learners reported a positive perception of their learning experience, emphasizing a sense of knowledge or skill acquisition facilitated using text summarization.

Table 2: Survey results with reference to Bloom taxonomy cognitive levels

Survey Question S/N	Questions	Cognitive Level	Overall mean	% of Agreed
9	Rate how useful the summaries were in helping you to remember concepts.	Level 1 – Remembering	8.3	87%
10	Rate how useful the summaries were in helping you to understand concepts.	Level 2 – Understanding	8.5	89%
11	Rate how useful the summaries were in helping you to apply concepts.	Level 3 – Applying	8.4	91%
12	Rate how useful the summaries were in helping you to analyse.	Level 4 – Analysing	8.3	87%

Previous research by Gonzalez et al. (2023) found that learners who reviewed both lecture videos and automatically generated summaries showed improved performance, indicating an overall enhancement of the learning experience. Similarly, the results of this study suggest that learners perceive summaries as beneficial for remembering, understanding, applying concepts and analyzing information. Together, these findings highlight the dual role of summaries: they not only streamline content review but also foster deeper engagement with course material.

RQ2: Are there differences in learners' perceived learning when text transcription and text summarization are used in distinct subject areas?

A t-test was conducted to compare the mean scores obtained by students in the Year 1 Statistical Research Methods LU and the Year 2 Supervised Learning LU. The results of the t-test indicate that there was no statistically significant difference in the mean scores for all survey questions, as all p-values were greater than 0.05. This suggests that the observed data does not provide strong evidence of a difference in learners' perceived learning between the two groups, despite their enrollment in different subject areas.

While the Year 1 Statistical Research Methods LU is typically classified under statistics and the Year 2 Supervised Learning LU falls under machine learning, these units share conceptual similarities due to the competency-based structure of our curriculum. From Figure 1, Statistics Research Methods serves as a foundational scaffold for Supervised Learning, enabling learners to build competencies progressively. This overlap may explain the lack of significant differences in learners' perceptions of the utility of transcripts and summaries across the two units.

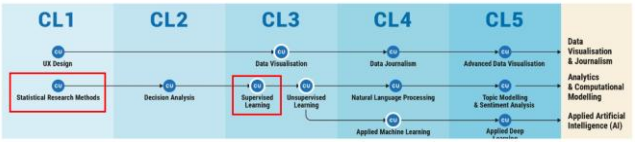

Figure 1: Part of Diploma in Applied AI & Analytics Competency Map

The study employed a quantitative research approach, involving two distinct groups of learners: 69 students from the Year 1 Statistical Research Methods LU and 61 students from the Year 2 Supervised Learning LU. While the quantitative approach effectively addressed the research questions, the data collection process relied on an optional survey that learners completed at their own pace. Unfortunately, this led to a suboptimal response rate, with only 47 out of 130 learners participating—a rate of less than 50%. As a result, the findings may not be fully representative of the overall learner population, potentially limiting the generalizability of the results.

Although the study primarily followed a quantitative methodology, a few open-ended questions were included to capture learners' perspectives on the effectiveness of transcripts and summaries. However, the survey results suggest that these questions may not have been comprehensive enough to elicit deeper insights into

learners' viewpoints. This limitation highlights the need for future studies to incorporate more robust qualitative methods, such as interviews or focus groups, to gain a richer understanding of how learners perceive and utilize these learning materials.

Conclusions

The existing quantitative approach provides insights into learners' perceived learning effectiveness; however, it does not clarify the underlying factors influencing their perceptions. Study by Halverson and Graham (2019) and Shi et al. (2021) on blended learning environments have successfully employed mixed methods to explore complex learner experiences. By adopting such an approach, the research findings would be more meaningful, incorporating both quantitative and qualitative methods. A focus group discussion could complement the survey by offering deeper insights into how the two different types of text impact learners.

To examine potential differences in perceived learning outcomes when using text transcription and text summarization across distinct subject areas, learners from two different Learning Units were selected: Statistical Research Methods, which focuses on statistics, and Supervised Learning, which emphasizes machine learning. Since both units are related to Artificial Intelligence, this may have influenced the survey results.

Furthermore, conducting a survey with the same group of learners would be preferable. The selection of Learning Units should also be as distinct as possible. For instance, Network Technologies and UX Design in Web Development, which will be offered to more than 500 Year 1 learners in the School of Information Technology during AY2025 Semester 1, could serve as suitable options. These units focus on different aspects of Information Technology, scaffolding toward different IT competencies across the diplomas. Moreover, selecting units offered in the same semester at the Year 1 level would help ensure more accurate comparisons, as learners would not have the advantage of prior exposure to text transcription and summarization tools. By addressing these methodological considerations, future research can provide more robust and nuanced insights into the effectiveness of text transcription and summarization as learning aids, while minimizing potential confounding factors.

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