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Annotating Throughout or Annotating Afterward: Preservice Teachers' Experiences with the ANNOTO Hyper-Video in Blended Learning

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Abstract: This study aims to explore the perspectives of pre-service teachers (PSTs) regarding their experiences with the ANNOTO personal note feature within a blended learning (BL) context. Employing qualitative research methods, the analysis incorporates reflections from 45 PSTs, insights derived from two focus groups, and data gathered through semi-structured interviews. The objective is to comprehend how PSTs engaged with ANNOTO's personal note during their learning experiences and how they perceived its role in shaping their professional development. The findings underscore a predominantly positive experience among PSTs, with their perceptions linked to heightened motivation and meaningful learning. Additionally, the study identified three distinct annotating styles—annotating throughout watching, annotating after watching, and a combination of both—each associated with enhanced concentration, memory prompting, and improved writing skills. Furthermore, PSTs articulated professional insights related to teacher and student agency, encompassing themes such as the use of video as a teaching tool, active learning, self-directed learning, scaffolding, critical thinking, and temporal considerations aligned with students' needs. The principal implications center on the necessity of engaging in discussions with PSTs regarding the integration of hyper-video and the pedagogical approaches it may endorse.

Keywords: blended learning; teacher education; self-directed learning; critical thinking; professional development

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1. Introduction

As blended learning (BL) has become an integral part of teacher education [1], there is a growing need to understand the contribution of various technological platforms supporting pre-service teachers' (PSTs) training process in this pedagogical context. In previous research [2], it was found that in a shift to BL and concerning the online component of BL, teacher educators (TEs) gave the highest success to pedagogies based on integrating YouTube and Podcasts, while PSTs rated synchronous frontal lectures via Zoom as the most successful online pedagogies. However, compared with TEs, PSTs rated the success of asynchronous self-directed learning considerably higher. Thus, there is a need to bridge the gap between the perceptions of TEs and PSTs by exploring online technological platforms that may support both perspectives. According to Rasheed et al. [3], there is a need for a closer look at pedagogies that may enrich the hitherto sparse and inconclusive evidence concerning the online component of BL. Understanding the differences between traditional and online teaching can empower TEs to design better online components [4]. Additionally, as promoting PSTs as reflective practitioners is a central element in teacher training, focusing on technology platforms that support reflection practices is crucial [5].

Recent empirical evidence suggests that hyper-video platforms may serve as useful tools when integrated into the online component of BL [6,7]. For instance, Evi-Colombo et al. [8] and Seo et al. [7] found that annotating in a hyper-video environment promotes practices and skills such as elaboration, justification, and reflection. Other studies have

shown that the annotating feature of hyper-video tools contributes to student concentration and active learning [9], promoting self-directed learning [10] and collaborative learning [11]. However, Seo et al. [7] found that students in fully online courses use video more adaptively and strategically than students in blended courses. In addition, Douglas et al. [12] compared the attitudes of students and teachers from various disciplinary backgrounds toward their experience with hyper-video in the context of BL. While they found that hyper-video reinforced and deepened reflective learning, most participants from the education group expressed a strong preference for on-campus face-to-face (F2F) learning over learning with the hyper-video annotation tool integrated in the online component of BL. These findings highlight the need for further investigation of integrating hyper-video in BL, particularly in the context of teacher education. In this regard, the current study focuses on ANNOTO as an example of hyper-video technology that may support PSTs' self-directed learning while integrating, for example, YouTube videos. Founded in Israel in 2015, ANNOTO is a B2B SaaS company revolutionizing video-based learning through interactive engagement technologies. The platform enables users to annotate videos, fostering collaborative learning and deeper engagement. Equipped with sophisticated assessment tools, ANNOTO evaluates learner participation and outcomes. ANNOTO is globally used by various academic institutions such as NYU, Georgia Tech, and Padova University (e.g., [13]). In the current study, ANNOTO serves as an example of hyper-video annotation solutions. The ANNOTO tools was chosen because it is the hyper-video tool integrated into the Moodle platform used in the sampled college.

It is noteworthy that in this study, we address integrating YouTube videos as a pedagogical tool and not as a training modality (e.g., [14]). This could be intriguing because research on integrating hyper-video into teacher education is scarce, primarily focusing on microteaching videos in which PSTs evaluate their teaching (e.g., [5]). ANNOTO, as a hyper-video, enables PSTs to post and comment across the video content, comment on peer posts, and write personal notes in a 'personal notebook' feature [15]. Thus, it supports TE's perceptions regarding the success of integrating YouTube videos while aligning with PSTs' perceptions of the extent of the success of self-directed learning.

Sauli et al. [16] conducted a comprehensive review of hyper-video for educational purposes and found that most studies tend to use quantitative methods. They also observed that the integration of hyper-video tools is often designed as a laboratory experience rather than as part of an in-field instructional design. Our study addresses these research gaps by adopting a qualitative approach to understand how PSTs perceive their experience with using ANNOTO's personal note feature in a BL teacher preparation program. We aim to explore the PSTs' actual annotating process and their perceptions regarding the contribution of annotating in a hyper-video environment to their learning process and professional development.

2. Literature Review

2.1. Blended Learning in Teacher Education

BL is a flexible approach that combines traditional F2F with an online component [17]. This approach is not restricted to technical experts or distance-learning students but can be effectively utilized in various educational settings [18]. Graham [19] argues that BL instructors should harmonize the F2F and online modules.

The corpus of studies on integrating BL in teacher education is still deplorably small [20]. BL is a transformative tool in teacher education, offering a balanced program that upgrades skills and knowledge while promoting reflection [21]. It is particularly effective in providing flexibility, motivation, cost savings, and equality [1]. However, its success in teacher education depends on the articulation of instructional differences and the understanding of key pedagogical strategies [22]. Despite its widespread use, there is a need for more comprehensive research to provide evidence of the benefits of BL [23]. Moreover, instructors should also explore the unique contributions of the pedagogies

and the technologies that are joined with them, which are chosen to be implemented in both modules.

BL in teacher education was found to support pedagogies related to self-directed learning with an emphasis on learner autonomy. This is directly related to the progressive learner-centered approach that emphasizes the importance of shifting the learner's role from a passive to an active learner who is in charge of their learning [4]. According to Little [24], learner autonomy involves the "capacity for detachment, critical reflection, decision-making, and independent action". Designing a BL environment that supports learner autonomy may also shift the TE's role to a facilitator or moderator focused on providing the support and scaffolding needed by the learner [2] (p. 4). Empirical evidence indicates that in activating pedagogies supporting learner autonomy and promoting self-directed learning, learners invest more time and effort in their learning process and are generally more motivated to promote independent exploration while taking control of their learning [25].

Although BL has many contributions, Howard [26] describes how general education faculty staff, largely neophytes of BL, navigate the contextual shift from F2F to BL and negotiate their professional identities. She found that attitudes toward BL among the staff were largely negative, owing to a sense of ineffectiveness, uncertainty, personal disharmony, and devaluation of their pedagogical worth. Thus, there is room to explore how to design and develop the online component while supporting self-directed learning and providing technologies that suggest support and scaffolding for PSTs. In addition, PSTs who are exposed to the TE's strategies in the online component while experiencing the learning process may reflect and incorporate the online component models in their future teaching.

According to Sun [4], numerous studies have indicated that online teaching outperforms traditional classroom teaching. However, TEs tend to regard online teaching as more difficult and workload-intensive than teaching traditional courses. Hence, user-friendly technologies become crucial in online teaching. The next section will focus on the contributions of hyper-video as a user-friendly technology that can be easily integrated into the online component of BL.

2.2. Hyper-Video and Annotations

Video is often employed in education to enhance lessons, serve as a trigger, illustrate or visualize ideas, foster discussion, and support different learning styles. The contributions attributed to integrating video in teaching and learning are primarily based on cognitive theories such as The Cognitive Theory of Multimedia Learning [27] (Mayer, 2005). Video has been found to facilitate comprehension and the transfer of knowledge, especially in learning complex systems or processes. However, the use of video in educational settings can still be described as reproducing the passive role of the learner, as watching videos is usually linear.

In contrast, hyper-video refers to non-linear video that offers beyond-standard video control options (e.g., play, pause, and stop buttons) external resources that enable users to receive feedback, answer questions, and write annotations across the watching process [15]. According to Sauli et al. [16] (p. 122), hyper-video can be defined as "a non-linear video that presents both classical (e.g., play, pause, stop, and rewind/forward buttons) and more complex (e.g., table of contents and index) functions to control the navigation of the video stream, and it is enriched with hyperlinks giving access to additional material through specific markers or hotspots. A hyper-video can also be provided with a variety of exchange options, including the possibility of being directly annotated within the interface showing the video, both individually or collaboratively".

Video annotation involves integrating notes into video-based artifacts while watching them, either directly on the video frame or outside of the video area but in the same window or interface, for example, Figure 1:

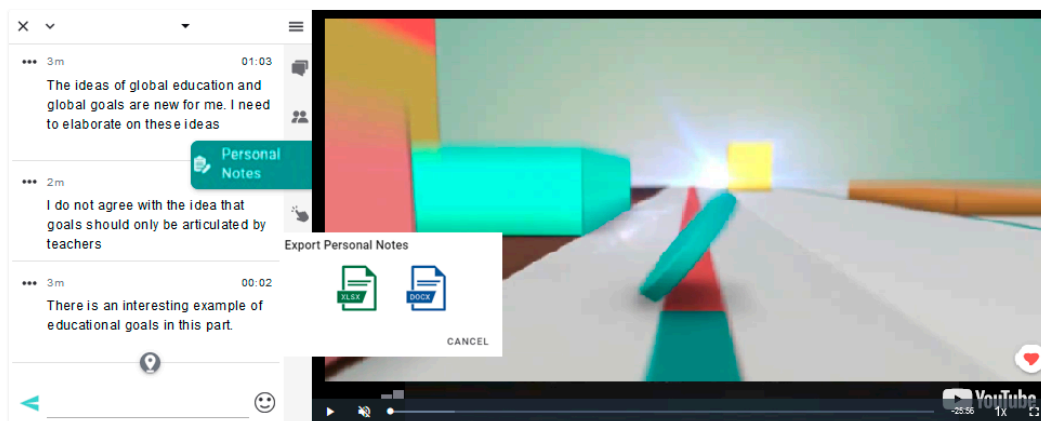


Figure 1. An exemplar of the ANNOTO personal note feature.

In addition, there is a collaborative video annotation feature that allows users to share posts and receive comments in the hyper-video learning space. Tools such as ANNOTO enable learners to generate a Word or PDF file by gathering all their notes taken with corresponding frames (see Figure 2). The annotating option is interesting as it is a unique feature of hyper-video that may promote reflection as part of the learning process. However, one may argue that in hyper-video, there is less room for self-disclosure, expression of emotions, and group cohesion, as it promotes a focus on asking questions related to a specific point in the video [15]. Hyper-video annotation, via shared writing and/or personal notes, supports active learning directly while watching the video rather than discussing the video's content after watching [28].

Annoto

30 Jan 2024 08:45:20 GMT

Anonymous's personal notes

Course: Curriculum Planning and Evaluation

Video: Educational Goals

Link to video: <https://moodle.levinsky.ac.il>

Video duration: 14:57

00:02 of the video

30 Jan 2024 08:39:49 GMT

There is an interesting example of educational goals in this part.

01:03 of the video

30 Jan 2024 08:42:22 GMT

the ideas of global education and global goals are new for me. I need to elaborate on these ideas

01:03 of the video

30 Jan 2024 08:40:56 GMT

I do not agree with the idea that goals should only be articulated by teachers

Figure 2. An exemplar of the ANNOTO personal note integration into a WORD file.

Empirical evidence indicates that both TEs and PSTs reported satisfaction with integrating hyper-video, finding it supportive in linking theory and practice, modeling, framing attention, increasing motivation to learn, proving reflection skills, and avoiding cognitive overload [5,29,30]. Sauli et al. [16] found in their comprehensive review of hyper-video for educational purposes that it provides users with flexibility, control, autonomy, and motivation. According to Mu [31], annotating in a hyper-video environment using personal notes contributed to a more focused watching of the video content. Hyper-video was also found to promote collaborative learning by interacting with peers while and through watching the video [32]. However, there is evidence that students tend to prefer “the traditional

and passive function of viewing the videos to a much larger extent than any of the active functions available to them" [28], p. 1760. They argue that these preferences may be related to demographic and mandatory characteristics of the learning process. According to Blau and Shamir-Inbal [15], the pedagogical potential of hyper-video may be different from traditional pedagogies; however, only a few studies have explored the learning potential of hyper-video in the context of teacher education and from the perspectives of PSTs. In addition, Sidi et al. [28] add that although hyper-videos can enhance self-regulated learning, the actual realization of the potential contained in the hyper-video learning environment remains an open question. Thus, to shed light on PSTs' perceptions of the contribution of hyper-video to their learning process and professional development, the following research question was articulated:

What are the perceptions of PSTs regarding their experience with using ANNOTO's personal note feature, and how do they perceive ANNOTO's contribution to their learning process and professional development?

2.3. Method

Delving into the perceptions of PSTs concerning their learning experience in the ANNOTO learning environment and revealing its contribution to the PSTs' learning process, a qualitative paradigm within a phenomenological genre was adopted [33]. In educational phenomenological research, exploration focuses on the meanings that learners attribute to the learning process within a specific context, aiming to understand how this process influences learners' behavior and beliefs [34].

2.3.1. Participants

The introduction of ANNOTO hyper-video technology at the college was initially embraced by a limited number of TEs, with even fewer opting to incorporate it into their courses. This led to an exploration of PSTs' perceptions regarding the application's utility in their learning and training. This study focuses on 45 sophomore PSTs (42 females and 3 males) enrolled in the core course "Curriculum Planning and Evaluation", where the TE integrated ANNOTO's personal note feature. The cohort, with an average age of 23.7 years, aimed to become elementary school teachers, specializing in various fields. Despite being unfamiliar with ANNOTO, the participants engaged in a semester-long BL model, featuring online and F2F sessions. TE enhanced the online component by integrating ANNOTO. During the F2F sessions, discussions on curriculum planning goals were complemented by YouTube videos. PSTs, prompted to annotate videos using ANNOTO during online sessions, later reflected on their experiences through personal blogs on the MOODLE platform. Ethical considerations were upheld, with PSTs granting permission for research use and participating voluntarily in focus groups and interviews. Anonymity and unbiased procedures were maintained throughout the data collection and analysis. The study was conducted in accordance with the Helsinki Declaration, and the protocol was approved by the Ethics Committee of the college sampled.

2.3.2. Data Collection

The study employed three distinct research tools for data collection: Firstly, PSTs posted reflections on personal-reflective blogs after completing hyper-video assignments using ANNOTO. These data are crucial for evaluating the application's contribution to the PSTs' learning process and professional development [35]. Second, two focus groups were conducted, each consisting of eight PSTs. Focus groups, acknowledged for their utility in exploring complex behaviors and motivations, serve as a valuable method for in-depth examination [36]. The aim of the two focus groups was to shed light on the PSTs' learning experience with the hyper-video annotating process in the context of BL. Accordingly, the discussions revolved around two main questions: 1. Can you describe your experience with ANNOTO? 2. What do you think are the pros and cons of learning with ANNOTO?. Each group discussed these issues for 60 min, and then for 10 more minutes summarized

the issues and ideas. Third, semi-structured interviews were carried out with five PSTs [37]. The interview questions aimed to delve into aspects that shed light on the contribution of ANNOTO to the learning process and training of PSTs. The interview questions were as follows: Can you please describe your learning process with ANNOTO's personal note feature? Do you think ANNOTO's personal note contributed to your learning process? Why or Why not? Do you believe that ANNOTO's personal note contributed to your understanding of the video content? Why or Why not? How can you envision using hyper-video as a teacher in your future classes? What have you learned from experiencing ANNOTO's personal note feature both as a student and as a future teacher? Collectively, the three research tools were deemed appropriate as they enabled consideration of the PSTs' "voice" [38] and facilitated understanding of the potential benefits of implementing ANNOTO hyper-video, along with the unique experiences of PSTs using this application. Moreover, the use of multiple evidence resources [39] enhances the trustworthiness criterion of the study.

2.3.3. Data Analyses

Strauss and Corbin's theoretical framework [40] posits that a profound comprehension of researched phenomena can be attained through the lens of participants' perspectives. Aligning with the overarching aim of this study, which endeavors to explore PSTs' perceptions regarding their learning experience with ANNOTO within their asynchronous online learning milieu, a methodological approach grounded in Nowell et al.'s [41] six-phase inductive thematic analysis was methodically applied to fortify the study's trustworthiness. To bolster the rigor of the data analysis, a TE colleague was enlisted as a second rater.

In the initial phase, the researchers immersed themselves in the dataset by comprehensively reviewing the PSTs' reflections, transcribed interviews, and focus group discussions as an integrated whole. In this phase, each of the researchers was familiarized with the data that were combined into a single long Word file. Subsequently, in the second phase, both the researcher and the second rater independently scrutinized the entirety of the data to glean an overarching impression of content, assigning initial emic codes to encapsulate emergent patterns. This iterative process led to the formulation of a comprehensive code book by each rater, wherein each code was meticulously explicated and exemplified through pertinent passages from the dataset. The third phase concentrated on the discernment of overarching themes, elucidating connections and hierarchies of concepts in concordance with Braun and Clarke's conceptualization [42]. A theme, within this context, was construed as a discernible pattern of shared meaning embedded across the dataset elucidating the PSTs' perspectives on integrating ANNOTO within their learning process and its contributive role in the PSTs' learning and training. To achieve this, the raters convened multiple times to deliberate on their findings, and insights, and to reconcile any divergences in thematically categorizing the emergent themes.

In the ensuing fourth phase, the agreed-upon themes underwent rigorous scrutiny for concordance between the two raters. A detailed examination of passages related to each coding category transpired, resulting in an intercoder agreement of 90% according to Cohen's coefficient [43]. Table 1 presents the leveraged codes and the frequencies of their appearance for each source of data. Subsequently, in the fifth phase, the ratified themes underwent a definitive definition and nomenclature process through consensus between both raters. The concluding sixth phase was centered on the meticulous organization of the agreed-upon themes within the forthcoming findings section, ensuring a coherent and logically structured presentation of the research outcomes.

Table 1. Leveraged codes from focus group transcripts, PSTs reflections, and interviews.

Source of Data	Theme 1: Experience Using ANNOTO (n)	Theme 2: Contribution to the Learning Process (n)	Theme 3: Professional Development (n)
Focus group 1 (N = 8)	User-Friendly (8) Enjoyable (6) Challenging (4)	Annotating throughout (4) Annotating afterward (4) Prompting memory (8) Active learning (7) Self-directed learning (5) Deepening (3) Concentration (6) Critical thinking (3) Writing skills (3) Shy students (1)	Teaching tool (4) Personal learning (8) Collaborative learning (8) The role of time (7)
Focus group 2 (N = 8)	User-Friendly (7) Enjoyable (7) Challenging (3)	Annotating throughout (5) Annotating afterward (4) Prompting memory (7) Active learning (6) Self-directed learning (4) Deepening (2) Concentration (5) Critical thinking (4) Writing skills (2)	Teaching tool (5) Personal learning (6) Collaborative learning (5) Scaffolding (2) The role of time (5)
Reflections (N = 45)	User-Friendly (39) Enjoyable (41) Challenging (6)	Annotating throughout (23) Annotating afterward (22) Prompting memory (45) Active learning (42) Self-directed learning (10) Deepening (17) Concentration (38) Critical thinking (38) Writing skills (12) Shy students (6)	Teaching tool (30) Personal learning (43) Collaborative learning (12) Scaffolding (16) The role of time (29)
Interviews (N = 5)	User-Friendly (3) Enjoyable (4) Challenging (2)	Annotating throughout (4) Annotating afterward (4) Prompting memory (5) Active learning (4) Self-directed learning (2) Deepening (3) Concentration (3) Critical thinking (2) Writing skills (2) Shy students (1)	Teaching tool (5) Personal learning (5) Collaborative learning (2) Scaffolding (3) The role of time (2)

N = number of PSTs; n = frequency of code appearance by the number of PSTs who addressed each code.

2.4. Findings

The findings section articulates the principal themes common across the three data sources—reflections, focus groups, and interviews—that are relevant to the research inquiry. Texts related to each theme are introduced in an interwoven manner to create a cohesive and integrated presentation of the findings.

2.4.1. PSTs' Descriptions of Their Experience Using ANNOTO Personal Note and Its Contribution to Their Learning Process

User-friendly, instrumental, and enjoyable versus Challenging

A prevailing consensus manifested among nearly all PSTs delineating their interaction with ANNOTO as a positive and beneficial learning experience. A significant majority conveyed that using ANNOTO's personal note feature was remarkably user-friendly, representing a distinctive departure from traditional learning methods. In addition, numerous

PSTs expressed genuine enjoyment in incorporating a novel technological dimension into their pedagogical toolkit, underscoring an enthusiastic embrace of innovation within the learning process:

I am new to ANNOTO. We haven't used it in any course before, but I always enjoy learning new things.

You can annotate and reflect while watching a video, all in one place without switching between screens. It makes things really easy and not annoying.

Taking notes during the video is convenient. I could write in my notes while the video was paused, allowing me to jot down thoughts without missing anything when the video was paused for note-taking.

However, it is noteworthy that some PSTs reported encountering challenges and experiencing limited productivity with the personal note feature. This difficulty was attributed to issues arising from downloading their personal notes as Word files, leading to typographical errors, particularly when typing in Hebrew, or encountering difficulties with its functionality:

When I tried downloading my notes in Hebrew, it all got mixed up, and I had to spend way too much time fixing it.

Using Annoto was a bit of a struggle. Every time I tried to add a note, it forced the video to pause, messing up my flow. I wanted to write down my thoughts as I watched, but I had to stop each time just to get it down.

Annotating throughout and/or Annotating afterward—Prompting memory

Slightly more than half of the PSTs asserted that they engaged in simultaneous video-watching and annotation. In this approach, the PSTs paused the video each time they wished to annotate content they deemed interesting or noteworthy. Conversely, the remaining half of the participants indicated a different strategy, opting to watch the entire video before subsequently annotating and reflecting on its contents. The PSTs associated both methods of annotation and reflection with the facilitation of memory recall and enhanced concentration:

The personal-note feature helps me remember things from the video and not forget what was discussed.

It is nice to receive tasks that are a bit different and interesting. This way, I remember the material better.

If I had watched the entire video, I don't think I would have remembered important parts. Annotating throughout watching encourages me to write more deeply about the important parts.

In contrast, some PSTs preferred to watch the entire video first:

I first watched the video and only afterward I annotated. This is how I could remember the video's content.

Trying to write comments or notes during the video was tough for me. At first, I tried to write a line, but I couldn't keep up with listening, and I kept rewinding. So, after a few minutes, I decided to just watch the whole video and then refer to it on the personal-note. That worked much better for me, and I found out I prefer watching the video first and then writing my response.

I like to see the whole picture before I write my thoughts and reflect on the video. If I annotate while watching, I lose my train of thought.

Some PSTs intertwine annotating throughout their watching with elaborating on the annotation afterward:

I annotate the video's content throughout watching. I annotated shortly a few points and when I finished watching I elaborated on these points. I could not elaborate through watching because I felt it cut my watching process.

First, I watched the video and stopped during my watching to quote parts of the discussion or to write some comments. Later I watched the video again to see if I missed something and to edit my writing in my personal-note.

Active learning and self-directed learning: Deepening, concentration, and critical thinking

Most of the PSTs could relate their learning process using ANNOTO to being active learners:

Watching the video with ANNOTO, I felt that I needed to be more active in my watching. I think I needed to be more concentrated on what the guys [The participants in the video] were discussing and to think if it was important to annotate or reflect on this point in the video or not. I think that I became more critical while watching because I wanted to comment on things that I did not agree with.

I liked using the personal notebook because it encouraged me to delve into the video, not just passively watch it, but actively engage with it.

It feels that annotating through watching brings your focus to another level. You need to focus on ideas and questions are raised.

I would be happy to continue learning with ANNOTO because it trains us in comprehension while watching and strengthens our understanding of the content.

Writing skills

Using ANNOTO was found to be related to PSTs' writing characteristics and skills. Some PSTs reflected that the ANNOTO personal note feature supported their writing-based learning style:

For me, a learning method that includes writing helps me better understand the material.

Some people find it easier to express themselves in writing and have more difficulty expressing themselves verbally, and that [the personal-note feature] can help them a lot.

Other PSTs related to improving their writing skills by rewriting their annotations:

I wrote and erased several times, and watched the video while simultaneously taking notes. Then, I revisited my notes, refining my writing style and thought process. Writing during the process also helped me formulate my thoughts and arrive at conclusions following the numerous changes I made throughout the learning.

The ANNOTO personal-note helped me go over my thoughts, see if I had any more important points to add or refine.

I wrote down important points while watching the video. Afterward, I expanded on them to express myself better. It's different from my usual writing where I have to keep things short. Here, I had to go into more detail.

Shy Students

Several PSTs claimed that they liked to watch the video and annotate using ANNOTO because they felt that they could express themselves better and annotate more freely in the ANNOTO personal note:

Some people do not want to express their opinions in front of everybody. The ANNOTO enables them to write in the personal-note their private opinion in a way that no one can see what they write and without being criticized by others. I myself shy person and I do not express my opinion in public because I am afraid of criticism.

Speaking in front of an audience, especially when you don't know all the attendees or even the lecturer personally, can sometimes create an unpleasant feeling. The option to watch

and respond to the video, not in front of everyone, removes the pressure I feel regarding the other students.

2.4.2. Professional Development

Using the ANNOTO hyper-video and reflecting on their learning experience yielded valuable professional insights for the PSTs as future teachers.

Teaching tool

Some PSTs directly related insights to using video as a teaching tool. These PSTs described some undermining thoughts related to the integration of video in teaching:

I think that integrating video into my lessons may not be as helpful for all my students as I thought it would be. In my experience with ANNOTO, I think now that maybe watching and annotating by yourself may be better and more effective.

One may prefer to watch and annotate during the video, and one may prefer to annotate after watching. I think that how one learns from a video is a matter of learning style.

Scaffoldings—Guiding questions

Some PSTs noted that guiding questions during the video watching process can serve as scaffolding in the annotating process:

Reading the assignment guidance first and then starting the watching was very useful. I felt that keeping with these questions made me capture the most important parts of the video.

The guiding questions connected to the video helped me learn more about the content and to think deeply about different ideas related to the topic.

Personal learning vs. collaborative learning

The PSTs delineated insights on the advantages and disadvantages of employing the ANNOTO's personal note in the context of pedagogies emphasizing personal learning versus collaborative learning. On the one hand, PSTs advocated the personal note feature, highlighting its role in fostering individual concentration and active participation:

It [annotating using the personal note] allows the option to work on the task independently and without disruptions, at your convenient time and place.

In in-class discussions, fewer [PSTs] participate, less in-depth [discussion about the content of the video], referring only to a short segment, perhaps less meaningful, stating what they [PSTs] think without considering the wording.

However, some PSTs highlighted the missing potential of collaborative learning. These PSTs supported maintaining the more conventional approach to viewing YouTube videos (i.e., F2F within the classroom plenum, followed by subsequent discussion). According to these PSTs, the conventional method of YouTube integration fosters collaborative learning, provides exposure to diverse perspectives, and increases self-confidence:

In this learning [annotating using the personal-note], there is a lack of interaction with other students, hearing their opinions, and extracting new knowledge from them that I might not have reached on my own.

Students who do not express themselves in front of people, this does not help their self-confidence. Expressing oneself publicly increases confidence in speaking and expressing personal opinions.

The Role of Time

The PSTs offered professional insights into their learning experience with ANNOTO, particularly concerning the dimension of time. They articulated diverse perspectives on time, encompassing both positive and negative aspects.

On the positive side, some underscored how time enhances concentration on content through dedicated periods for annotation and watching a complete video. Additionally,

the autonomy to watch videos individually was viewed as advantageous, allowing for multiple viewings to address comprehension difficulties:

Watching and annotating by yourself may be better and more effective, especially for students who need more time to watch the movie or to watch it several times to understand the video content.

Some PSTs acknowledged the time constraint, noting that “the short time available makes it hard to listen to everyone’s thoughts about the video during group discussions. This might lead to some students losing interest in the conversation.” Furthermore, annotating while watching was characterized as a process of “sharing thoughts in real-time.” On the negative side, a PST mentioned a drawback, stating, “It took me too much time to annotate the video”.

3. Discussion

Higher education, including teacher education institutions, continues to develop a tendency to promote BL. This trend was accelerated in the context of COVID-19 and the shift to online learning as part of educational institution lockdowns [2]. In the shift to the post-COVID-19 era, BL was perceived by some scholars and stakeholders as a positive change that can be an inherent academic pedagogy integrated into higher education as the “new normal” of learning [44]. As BL is composed of two components—F2F and online—[19] it was found that there is room to continue exploring the pedagogies activated, especially in the online component, and how they shape the teaching and learning process in BL [2]. In this regard, the current explorative study investigated the experience of 45 PSTs in using the personal note feature of the ANNOTO hyper-video application. This feature was integrated into an asynchronous meeting activity as part of the PSTs’ learning in the online component of an academic course titled “Curriculum Planning and Evaluation” (micro context) and as part of the BL timetable design in the given teacher education college (macro context).

The research findings revealed that most of the PSTs enjoyed learning by annotating the video’s contents using ANNOTO’s personal note feature. These perceptions were related to the user-friendly design of the application and their satisfaction with using a new technological tool in their learning process. Some PSTs enjoyed the idea of being familiar with ANNOTO itself as a new technology that they had not been introduced to before. The PSTs’ positive experience was also related to an instrumental aspect related to the convenience of watching and annotating in the same online learning space. However, it is noteworthy that some PSTs described a negative experience related to typos and losing their train of thought when annotating through watching. In this regard, PSTs described two major styles of annotating in their learning process: (1) annotating throughout (i.e., annotating during watching the video), and (2) annotating afterward (i.e., annotating only after watching the whole video without stopping until the end). Slightly more than half of the PSTs preferred the first annotating style. These PSTs explained that annotating throughout watching supported them in delving into the content and understanding it better. However, almost half of the PSTs preferred the annotating afterward style. These PSTs explained that annotating throughout watching was very challenging for them because it made them unconcentrated. It is noteworthy that for both styles of annotating, reasons related to concentration and prompting memory were at the center. In other words, it was found that for some of the PSTs, the annotating throughout style made them more concentrated on the video’s content and helped them remember more details and ideas. For other PSTs, the annotating afterward style supported their concentration and the process of prompting memory in their learning process. Mayer [27] described the process of learning and creating memories according to the Information Processing Theory. Analyzing the PSTs’ perceptions according to this theory, one may conclude that exposing the PSTs to YouTube video content in a hyper-video environment may support their learning style as they may focus their attention and locate the video contents in their long-term memory from where they will be able to bring it back into working memory for conscious. In addition,

Popescu et al. [45] identified correlations between learning styles and student behavior in an educational hypermedia system. In their study, they found that active learners were more inclined to engage directly with educational content and invested more time in interactive learning tools. Conversely, reflective learners tended to lean more toward materials that offer clear definitions and examples. These learners preferred to analyze the subject matter, often reflecting on solutions provided by others. Drawing from Popescu et al.'s study results and those of the current study, it may be suggested that reflective activities accompanying the annotation process may support memory prompting in both annotating styles. Future research should delve into the role of reflection in the context of hyper video (see, for example, [13]). Nevertheless, hyper video may hold the potential to support students' learning styles when designed with flexibility of time and space, personalization, collaboration, and engagement in mind [16,29,46,47]. In this regard, the conditions that may support or prevent students' learning styles in the context of hyper-video, especially when integrated into BL, remain an open question for further investigation [48]. Additionally, the findings pointed to three major contributions of integrating hyper-video in the online asynchronous component of BL as perceived by the PSTs. The first contribution is related to prompting active learning; this contribution was associated with the PSTs' perceptions that annotating and learning in the hyper-video encouraged them to invest more time and thought in the assignment. They also felt that they were more concentrated when watching the video, and this concentration evoked more critical thinking about the contents presented in the video (see also [31]). Another contribution was related to writing skills. Some PSTs perceived that learning in the hyper-video environment improved their writing skills, especially because they looked through their writing in the personal note and rewrote their answers by watching the specific part of the video again. Similar results were found by Watkins and Wilkins [49], albeit not in the context of hyper-video. Some of the PSTs perceived that writing in the hyper-video environment developed a writing skill based on writing central ideas first and then providing a more in-depth analysis of these ideas or expanding them by adopting different perspectives. Finally, according to the PSTs' perceptions, the hyper-video environment may act as a space for supporting shy PSTs. A sizeable proportion of PSTs perceived the hyper-video environment as a safe space for shy PSTs to express their thoughts and ideas without being afraid of being judged by peers. Students' emotions, such as confidence or fear, were found to be one of the factors preventing students from participating in the classroom [50,51]. These three contributions may be related to each other, as according to Tinto [52], involvement matters. In other words, students who act actively and participate in the learning process may learn more than those who do not. In addition, active involvement in the learning process facilitates critical thinking [53] and facilitates the retention of information that might otherwise be lost [54]. In this regard, one may conclude that the contribution of the hyper-video environment based on the personal note feature may support the active learning of shy as well as outgoing PSTs.

Moreover, the findings revealed that annotating in the hyper-video environment supported PSTs' professional development, as reflected in various insights. The first professional insight was related to YouTube videos as teaching tools. The PSTs' self-experiences of learning in the hyper-video environment enabled them to gain insights related to integrating video into their future classrooms. Some PSTs pointed to the idea that there is a need to connect YouTube as a teaching tool and the student's learning style. This insight was related to the idea that there are students who may not gain much from watching the video in a short time in the classroom, while watching it by themselves and annotating its content might be more effective for some of them [55]. Another professional insight was related to the active role of students in watching a video and the need to provide them with scaffolding, such as guiding questions that may support students' deepening of the video's contents. The importance of providing guiding questions for students in the context of integrating YouTube as a teaching tool was also reported by Barnes et al. [56] and Chiu [57]. These professional insights relate to the potential roles that teachers can play

in facilitating student engagement and interaction. Thus, the exploration of ANNOTO's personal note feature illuminated the varying strategies employed by teachers, highlighting the notion of teacher agency.

Few PSTs also described professional insights related to shy students who may not participate in F2F discussions on the video's contents and may prefer to express their thoughts and ideas in writing. Analyzing this insight from a sociological perspective, Weaver and Qi [58] suggest that students' constraints on participation might be understood in terms of the formal and informal classroom structures within which they are embedded. According to these scholars, "classrooms are the workplace for instructors and students, where statuses are defined, goals and tasks are laid out, and rules are specified. As with all organizations, beneath this formal structure lies an implicit, informal one where actors conduct their daily activities while adhering to mostly unstated rules pursuing ill-specified goals that may deviate from or even undermine the stated ones" [58] (p. 571). In such a view of the classroom, a shy student might prefer to observe classroom dynamics from a distance rather than actively participate or participate less frequently in class discussions, group activities, or interactions with the teacher. Thus, hyper-video may act as a kind of "transitory learning environment" that may support the needs of shy students until, according to Jackson [59], they learn to negotiate between both formal and informal systems to survive or thrive at all levels of their schooling.

An interesting professional insight was related to the fact that there were PSTs who advocated the importance of watching the video in the classroom and discussing its content in a more traditional manner (i.e., a few PSTs discussed with the TE the video contents) and PSTs who advocated the importance of using hyper-video. The first group of PSTs addressed that the more traditional manner of integrating YouTube in the classroom may promote collaborative learning, which was related to exposure to various perspectives. These PSTs' perceptions may be related to cognitive educational theories that have recognized the importance of interaction among peers within a classroom setting (e.g., [60,61]), considering learning to be a socially mediated process best facilitated by a verbal conversational exchange to create and enhance meaning. According to Chambel et al. [45], communication is a hyper-video feature that supports collaborative learning. However, it is worth noting that in the current study, the participants experienced learning with the personal note feature of the hyper-video tool, which is more oriented toward personal learning. This may explain the insights of the PSTs related to hyper video and collaborative learning. Nevertheless, the results of the current study suggest that interaction between peers may be important and useful for the learning style of some PSTs. Thus, TEs should consider hyper-video instructions that also support collaborative learning. The other group of PSTs opposed these arguments by adopting more classroom justice orientations. They perceived that traditional YouTube watching enables only a few students to be engaged in the discussion. This perception aligns with the concept of student agency, emphasizing students' active involvement and the importance of addressing diverse needs. It is in line with Smith et al.'s [62] argument that peer discussions combined with lecturing help distinguished students stay engaged in the material, resulting in greater learning gains and elaborating the gap between them and their peers. Hence, these PSTs tended to advocate hyper-video with an emphasis on it reflecting an integration of YouTube video that supports active learning for almost all students by addressing their different needs [63]. It might be concluded that according to the findings, the professional development of the PSTs and their awareness of ANNOTO's contribution to the learning process were associated with their characteristics as learners. For instance, PSTs who are shy and prefer annotating in the personal note rather than engaging in F2F classroom discussions may demonstrate a sensitive awareness of similar needs in their future students.

Finally, time was found to have an important role in shaping PSTs' perception regarding their experience in the ANNOTO hyper-video environment and their perceptions regarding its contribution. In this regard, in his Theory of Student Involvement in the context of higher education, Astin [64] (p. 522) argued that "the most precious institutional

resource may be student time". The theory posits that the accomplishment of specific developmental objectives by students is directly influenced by the time and effort they invest in activities specifically crafted to yield these advancements. In the current study, time was found to be a major theme in the PSTs' perceptions of experiencing ANNOTO. On the one hand, they felt that the hyper-video supported their need for flexibility in the time and place they watched the video. They also related to the fact that they could reflect and annotate on the video in real-time during their watching and also related to the fact that in the hyper-video environment, there is time for everyone to annotate the video and not just a couple of students discussing it with the teacher. On the other hand, some PSTs perceived using ANNOTO as time-consuming and preferred to watch the video and discuss it F2F. The time-consuming nature was also related to the need to rewrite their annotations after finishing watching the video. Similar to Sidi et al. [28], these PSTs preferred more passive watching as it was perceived as less time-consuming and less overworked.

This study has several limitations. First, the current study is based on a qualitative methodology and is explorative in its form concerning the number of participants and their gender distribution. Future research should incorporate quantitative methods to explore the attitudes of a larger and more balanced sample, including more male participants, to investigate potential gender differences in the annotating style. Another limitation is related to the ecological context of this study. All the participating PSTs had direct access to requisite technology and the internet. However, the current study did not examine the participants' technological proficiency or their acceptance of information and communication technology (ICT). This information could provide further insights into the results of the study and their interpretations. Next, the current study focused only on the personal note feature of ANNOTO. This might result in an experience of more personal self-directed learning. Hence, future research should explore other and more communal features of ANNOTO, such as the "chat" or the "people" features that aim to enhance collaborative learning and a variety of learning styles. Finally, future studies should also examine PSTs' demographic characteristics to explore their experience with hyper-video environments. The main conclusions of this explorative study may relate to the indication that learning in a hyper-video environment may promote students' active learning, reflected in their concentration in the learning process while prompting their memory and writing skills. In addition, hyper-video environments may support self-directed learning and students' unique learning styles and needs. Policymakers and stakeholders who advocate for BL as a constructive post-COVID-19 curricular change need to continue exploring the technologies and pedagogies activated in the online component of BL. In this regard, TEs should ask curricular questions such as why prefer to utilize a specific technology? What are the pedagogical contributions of the technologies chosen to be integrated into the online component and the F2F component of BL? How do the chosen technologies support students' various needs? How do the pedagogies activated in each of the BL components promote the connection between the F2F and online components? Reflecting on such questions with the PSTs, the TEs may model curriculum planning for BL. As a first step, TEs who promote PSTs' experiences of a variety of online pedagogies and then discuss these experiences with the PSTs may temper the PSTs' preferences for pedagogies that endorse passive learning and promote their awareness of the variety of needs of their future students in F2F as well as online environments.

4. Conclusions

The findings yield five primary conclusions pertaining to ANNOTO's personal note feature: (1) it has the potential to foster active learning and concentration during engagement with video content; (2) it contributes to self-directed learning within the online component of BL; (3) it aids in the development of writing skills as PSTs interact with video annotations; (4) it accommodates diverse learning styles by offering flexibility and support for individual preferences; and (5) it reflects experiences indicative of both teacher agency and student agency.

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