

Improving e-Learning Videos by Adding Sign Language Interpretation and Subtitles

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Abstract: As a professional academic supporting unit of the University, The Independent Learning Centre (ILC) at The Chinese University of Hong Kong (CUHK) has decided to provide additional support by adding sign language interpretation versions and subtitles to the existing self-learning videos. Such a project is pioneering in Hong Kong in addressing the needs of Special Education Needs (SEN) students. The project aims to benefit students with different levels of hearing impairment or other SEN as well as general students. While the revised videos will allow and encourage a wide range of students with different levels of learning difficulties to foster their independent learning skills, the added subtitles (Cantonese, Mandarin or English) can aid learning in terms of retention, comprehension, accuracy and engagement. Such benefit means general students are also expected to have their learning effectiveness increased by viewing these inclusive design videos. The whole project selected 98 videos from different self-designed online platforms, which would be over 10 hours in total. Once ready, the videos will be incorporated into the redesigned online platform and revised micro-modules accordingly. This paper aims to offer a first-handed and thorough perspective on the whole project in order to share the experience of supporting SEN and general students by making eLearning more accessible. When we are carrying out the project, we hope we can further benefit academia by sharing our successful experience. We believe the aims of the project can be further extended by sharing our experience with our academic peers, that is, our partners.

Keywords: sign language, subtitles, special education needs (SEN), videos, e-learning, independent learning

1. Background

Traditional education methods which spotlights teacher and textbook as the centre of classroom makes students passive in engaging in class. In the recent decades, new learning methods like flipped classroom, gamification, case study, social media, and self-learning are trying to tackle the problem and encourage the curiosity, creativity, and engagement of the students (Safapour, Kermanshachi and Piyush Taneja, 2019, pp. 1-5). Thanks to the fast development of technological invention and infrastructure, self-learning and distance learning through videos have been picking up popularity. Online learning has been blossoming especially from the outbreak of COVID-19. Using video to aid teaching and learning is not new to us. Whether it is for teachers to supplement teaching, to flip the classroom, to substitute face-to-face teaching, or for learners to do self-learning, these have already long existed and circulated. Research focusing on video teaching continuously improves the teaching effectiveness of using videos and provides concrete and effective reference criterion.

The research on how the design of teaching-related videos affects the viewers (students) learning effectiveness is beneficial to verifying or building various pedagogy theories. It also constructs the foundation of the practice of teaching. This explains why adding subtitles (captions) in videos which altered the amount of information and how the students receive them is attracting the attentions of researchers. Some researchers pointed out that in order to analyse the whether or not it provides positive effects by adding subtitles, one should pay attention to the video type. Although both language learning videos and content learning videos use subtitles, the learning goals of them are different. The former learning language and the latter non-linguistic contents. 'Studies have shown positive effects for subtitles for content learning in a second language.' (van der Zee, Admiraal, Paas, Saab and Giesbers, 2017, p. 19). Analysing this type of videos should focus on the learner. As an independent written content provider, subtitles extend the amount of information provided by the video. The change of information amount requires a higher cognitive ability from the viewers. Some researchers stated in order to build an effective criterion for the design of videos, the allocation of cognitive ability and attention are essential elements. (Zheng, Ye and Hsiao, 2021, p. 12). Thus, working memory limitation that corresponded to viewers should be paid attention to when designing subtitled videos. One should keep the visual-textual information complexity (VTIC) to a low level on subtitled videos. Adding extra subtitles on videos that already contain a high amount of visual-textual information brings cognitive overload. It is detrimental to learning effectiveness. (van der Zee, Admiraal, Paas, Saab and Giesbers, 2017, pp. 19-20). Cao Jian-xia, Yang Rong-hua, and He Li-ming's research supports this point. Their research set up three groups of students to compare with each other. These groups of students watched videos of Russian history with no-subtitle, brief-subtitle, or full-subtitle respectively. Given the

high amount of text information presented to the students by providing PowerPoint slides, 'subtitle presentation led to visual channel overload, which affected effective information processing'. the result is that the learning outcome of the brief-subtitle group and full-subtitle group were similar and both significantly lower than that of the no-subtitle group (Cao, Yang and He, 2019, pp. 144-147).

2. Aims of the project

The Independent Learning Centre (ILC) at The Chinese University of Hong Kong (CUHK) is eager to improve all existing eLearning resources, especially those videos on various self-developed Subject-Specific Online Platform. CUHK has always been trying to provide the best support for Special Education Needs (SEN) students. As stated in the University's 'Strategic Plan 2021-2025':

to ensure that no students will be left behind in the rapid advancement of eLearning, attention must be given to providing additional support to students with special education needs (SEN). (The Chinese University of Hong Kong, 2021, p. 25)

As a professional academic supporting unit of the University, ILC has decided to provide additional support by adding sign language interpretation versions and subtitles to the existing self-learning videos. While adding sign language interpretation videos can directly benefit students with different levels of hearing impairment, Joong-O Yoon and Minjeong Kim have also found out that:

providing captions in online content for deaf individuals along with sign language video clips had a positive effect on learning that exceeded that of sign language video clips alone. (Yoon and Kim, 2011, p. 287)

Moreover, the subtitles would benefit students with attention deficit hyperactivity disorder (ADHD), autism and dyslexia (Rev, 2017). Existing and future SEN students could all be benefited by this design. From 2017-2021, CUHK has admitted 424 students (University Grants Committee, 2022) that belong to 11 types of SEN:

- 1. Attention Deficit/Hyperactivity Deficit (ADHD)
- 2. Autism
- 3. Hearing Impairment
- 4. Mental Illness
- 5. Multiple types of Disabilities (for example Autism with ADHD, Autism with Hearing impairment etc.)
- 6. Physical Disability
- 7. Specific Learning Difficulties (for example Dyslexia, Non-verbal Learning Disabilities etc.)
- 8. Speech Impairment
- 9. Visual Impairment
- 10. Visceral Disability
- 11. Others

Based on the above arguments, 290 in total out of the 424 students could be benefited by the subtitles added (40 have Hearing Impairment; 57 have ADHD; 41 have Autism; 40 have Specific Learning Disability and 112 have Multiple types of Disabilities (University Grants Committee, 2022).) and the actual number would probably bigger as this data only shown the number of full-time students who report voluntarily to the University about their disabilities.

The subtitles added to self-learning videos would also benefit the general students. A research conducted in the fall of 2015 by the Oregon State University Ecampus Research Unit with 3Play Media that collected responses from 2000 university students across United States has found out that not only students reporting disabilities use subtitles at least sometimes (over 61.1%), over 50% of student not reporting disabilities also at least use subtitles occasionally. (Stritto and Linder, 2017). Most of the respondents would use the closed subtitles to help them focus, retain poor information, and overcome poor quality of videos. Small amount of the respondents would use the subtitles to learn a second language. (Linder, 2016, p.12) Hence, we can expect making existing self-learning videos more inclusive by adding Chinese (Cantonese/Mandarin) or English subtitles corresponding to the dialogues, can benefit all student of the University as learning aids that could help the user on retention, on comprehension, on accuracy and on engagement.

Currently, supports for the SEN students in CUHK is provided by the Wellness and Counselling Centre of Office of Student Affairs (OSA). However, the center’s support focuses on ‘enable disabled students to actively participate in campus life and to facilitate their learning’ (Office of Student Affairs, 2022), which means providing services such as campus transportation, accommodation, learning equipment, special lecture and examination arrangements and not focus on supporting SEN student to foster their independent learning skills through eLearning.

Hence, this initiative by ILC, adding sign language interpretation versions and subtitles to the existing self-learning videos, would be one of the first university-level projects in CUHK that aims at providing supports to the eLearning needs of the students with multiple type of disabilities and hearing impairment in CUHK. Not only at CUHK, such project is pioneering in Hong Kong on addressing the needs of SEN students. The self-learning videos created for the SEN students will encourage them to practice eLearning by using the resources and service of ILC, and also acquiring essential skill, such as academic writing skills and interview skills through online learning platform. Inclusiveness and learning effectiveness are expected to increase through making the new version. More students can be encouraged to do electronic- and self-learning.

The project would be suiting one of the main goals of the ‘Strategic Plan 2021-2025’ not by just providing direct learning support to the SEN student, but also by sharing the experience and setting up an example for other teaching units in CUHK. The experience sharing sessions and research findings presentations of this project can raise awareness and encourage more teaching units to offer supports in SEN student’s eLearning needs. Furthermore, the products and arrangements of the project can be a reference for the interested parties to develop their own ‘additional supports’ to the SEN students.

3. Methods for achieving the aims

The project aims at carrying system-level improvement in teaching and learning activities in the following ways:

- 1. Provide direct support to the eLearning needs of the current and future SEN students.
- 2. Encourage the SEN students to take control of their own learning by practicing self-learning on academic writing and job search related skills anywhere and at their own pace.
- 3. Encourage the general students to use the subtitles added as learning aids on retention, comprehension, accuracy and engagement to increase their learning effectiveness.
- 4. Assist both SEN and general students to develop their independent learning skills by introduce resources and services with inclusive design videos.
- 5. Enable and encourage a more direct interaction between SEN and general students by viewing the same inclusive design videos.
- 6. Promote awareness of the learning needs of the SEN students among staffs and general students.

To achieve the aims, the project plans to produce a considerable number of videos. 98 videos that over 10 hours in total will be produced. All videos can be divided into 3 types:

- (A) Sign language video with English, Mandarin or Cantonese subtitles added.
- (B) Videos with English, Mandarin or Cantonese subtitles added.
- (C) Sign language video without subtitles.

All selected videos are from 4 different online learning platform that developed by ILC. The distribution and the length of time of all the video are as follows:

Table 1: The distribution and the length of time of all the video

Platform	Type of videos						Total length of time
	A	Length of time	B	Length of time	C	Length of time	
Orientation of ILC	1	4 mins and 30 seconds	1	4 mins			8 mins and 30 seconds
GE Reflective Journal Micro-Modules (TDLEG)	5	13 mins and 53 seconds					13 mins and 53 seconds

Platform	Type of videos						Total length of time
	A	Length of time	B	Length of time	C	Length of time	
中文思辨寫作 (與人文對話 及與自然對 話) (TDLEG)	10	26 mins and 36 seconds	10	3 mins and 46 seconds			30 mins and 22 seconds
The Interview Skills Development System Extended (TDG)	12	7 hours, 46 mins and 43 seconds	49	1 hour, 24 mins and 23 seconds	10	32 mins and 9 seconds	9 hours, 43 mins and 15 seconds
Grand total	28	8 hours, 31 mins and 42 seconds	60	1 hours, 32 mins and 9 seconds	10	32 mins and 9 seconds	98 videos; 10 hours and 36 mins

We will setup peer sharing sessions ourselves or in collaborate with other units, such as Centre for Learning Enhancement And Research (CLEAR) or Office of Student Affairs (OSA), for interested university staff members and students on sharing their experience on making use of the videos.

Among the various types of videos produced by ILC, academic writing and career-related videos are the most welcomed. Thus, we selected the types of videos above to add subtitles or create a sign language interpretation version.



Figure 1: All the subtitles and sign language interpretations can be enabled or disabled by the viewers

To facilitate the self-learning practice, all the subtitles and sign language interpretations can be enabled or disabled by the viewers. (see Figure 1)



Figure 2: The video introducing the mission of ILC has two versions (Cantonese)



Figure 3: The video introducing the mission of ILC has two versions (English)

The video introducing the mission of ILC has two versions, an English one and a Cantonese one. Both videos can be found in the 'About ILC' at the ILC website. (see Figure 2 and Figure 3) They have been being played on the new student orientation events for every new intake of under- and post-graduates. The two videos have been reaching to the widest variety and the largest number of students. Another type of videos got high hit rates among first and second year undergraduates is about writing reflective journals for the university general education courses. CUHK requires all undergraduate to take three credits of 'In Dialogue with Humanity' and another three of 'In Dialogue with Nature' as their graduation requirement. Both courses set a homework of reflective journals in English or Chinese.

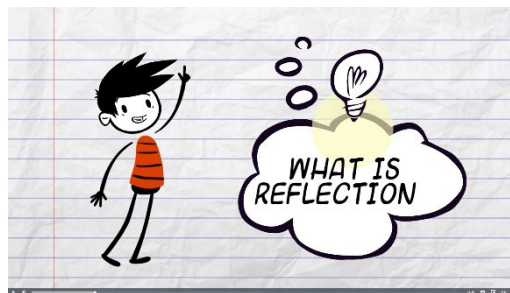


Figure 4: The English platform

ILC cooperated with the University General Education Foundation Programmes to launch a Micro-modules of Reflective Journal Writing for University General Foundation Programme. Micro-modules consist of online platform and workshops. The Chinese online platform explains essential knowledge and marking rubrics of writing papers through different kinds of instruction tools. Tools include self-learning videos, hints, exercises, references, and supplementary explanations (Chao, 2018, p. 142). Students can use the tools at their own pace. The English platform (see Figure 4) added a learning route in order to aid the students at different chapters can find a suggested route to make the best use of the whole platform. For the videos that have the sign language added, the interpretation is embedded with a 3:7 ratio to the original video (see Figure 5). Subtitles can also be selected to show simultaneously. Students can choose whatever they see fit.

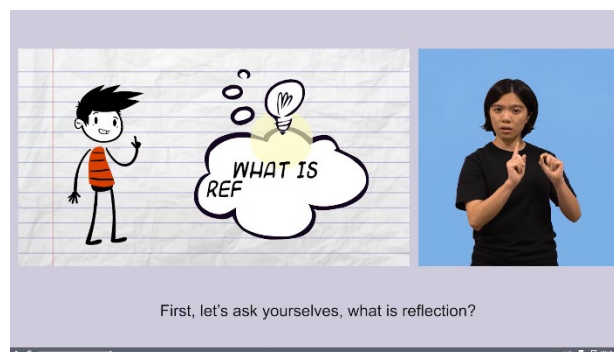


Figure 5: The interpretation is embedded with a 3:7 ratio to the original video

Career-related videos are also highly welcomed by the students. It helps participants with interview skills, scholarship applications, internship seeking, academic exchange applications, and graduate degree applications. These videos are placed or co-related to the online platform called 'Interview Skills Development System Extended Version' (see Figure 6). In total there are 51 videos with the length of 58 mins to 1 hour and 24 mins. Editing and uploading is still undergoing.

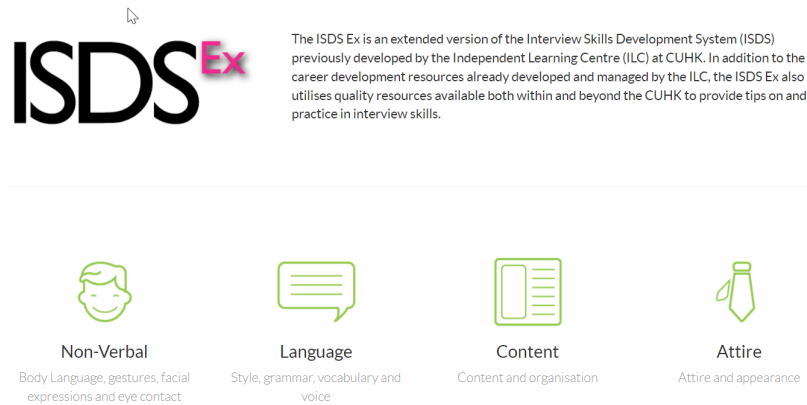


Figure 6: interview skills development system extended version

4. Evaluation

Most of the videos (96 out of 98) are part of the online learning platforms. Number of accesses to the videos (viewing) can be recorded and students can provide written comments in the feedback section of the online platforms.

ILC designed questionnaire and asked the teaching staff members taking care of the university general education to forward it to all the students (see Figure 7).

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1. 你是哪一個年度入學(*例如2021)的同學?

2. 你的主修是哪一科?

3. 你曾修讀或現在正修讀的大學通識基礎課程是:

- 與人文對話 (UGFH)
修讀學期 (*例如2021-2022 T2):
- 與自然對話 (UGFN)
修讀學期 (*例如2021-2022 T2):

4. 你懂手語嗎?

- 懂
- 不懂

→

Figure 7: Questionnaire

Among the information collected during 7 February to 9 March 2022, students are being very positive to the subtitles (there are no student who knows sign language replied in the period). 14 students replied 'Clearly understandable' for the question 'Do you think the subtitles added is clear and understandable?' 4 of them stated 'Subtitles are very clear and understandable and fits well with the video. Moreover, they can be read individually so that one can read to understand the video content.'

Students take the subtitles as a positive add-on to the videos. It helps them understand the video and assists their learning process. Regarding the questionnaire question ‘Do you think the video with subtitles added is helping you on understanding the content and notion taught?’ all 14 students replied ‘Yes’ and 11 of them selected ‘Able to help me on understanding the gabbled parts or the minor points that might easily be missed’. 9 of them selected ‘Able to help me understand more deeply the content’ and 8 ‘Able to make me understand thoroughly some concepts’.

In the section that allows students writing their own opinions, they highlighted some first-hand experience on using the subtitled videos: ‘Subtitles help me to concentrate watching the video’, ‘Subtitles make self-learning more convenient’, and ‘As Chinese is my mono-mother tongue, I am not familiar with certain kinds of the articulation of English. Subtitles help on understanding.’ The last comment quoted reflects subtitles help students overcome the difficulties on learning through a second language.

From the figures and analysis above, we can see that students regard the subtitles add-on raises their learning and self-learning effectiveness.

Furthermore, the Office of Student Affairs (OSA) that takes care of SEN students was contacted to help recruiting student helpers to give us feedbacks after they have reviewed the videos. We selected and interviewed the applications and appointed 6 student helpers, 5 of whom are with SEN. Feedback reports were received on early April 2022. Each participant is required to hand in four reports focusing on (1) Orientation of ILC; (2) GE Reflective Journal Micro-Modules (TDLEG); (3) 中文思辨寫作（與人文對話及與自然對話）(TDLEG) with Mandarin subtitles; and (4) 中文思辨寫作（與人文對話及與自然對話）(TDLEG) with Cantonese subtitles respectively. Here is a summary of the result on captions (only one of them is able to read sign language so it is excluded as the sample size is too small):

Table 2: Summary of the result on captions

Platform	Feedback				
	Caption accuracy and clearness	Helpful on understanding content	Helpful on understanding concepts being presented	Helpful on understanding content for SEN students	Helpful on understanding concepts being presented for SEN students
Orientation of ILC	Slightly agree: 2 Agree: 4	Agree: 5 Strongly agree: 1	Slightly agree: 1 Agree: 4	Agree: 4 Strongly agree: 2	Agree: 4 Strongly agree: 1
GE Reflective Journal Micro-Modules (TDLEG)	Slightly agree: 1 Agree: 3 Strongly agree: 2	Agree: 5 Strongly agree: 1	Agree: 4 Strongly agree: 2	Agree: 4 Strongly agree: 2	Agree: 4 Strongly agree: 2
中文思辨寫作（與人文對話及與自然對話）(TDLEG) Mandarin subtitles	Slightly disagree: 1 Agree: 4	Slightly agree: 2 Agree: 3	Slightly agree: 2 Agree: 3	Slightly agree: 1 Agree: 4	Slightly agree: 1 Agree: 4
中文思辨寫作（與人文對話及與自然對話）(TDLEG) Cantonese subtitles	Slightly agree: 1 Agree: 3 Strongly agree: 3	Slightly agree: 1 Agree: 5 Strongly agree: 1	Slightly agree: 2 Agree: 5	Slightly agree: 1 Agree: 5 Strongly agree: 1	Slightly agree: 2 Agree: 4 Strongly agree: 1
Percentage on the ‘agree’ realm	95.8% (23/24)	100% (24/24)	100% (23/23)	100% (24/24)	100% (23/23)

Besides the numeric rating, we emphasised the importance of written comments on the reports therefore we received quite some well-developed feedbacks. Overall, the comments can be categorised into three main aspects of the benefits of adding subtitles. The following quotes are all verbatim copy from the comments.

5. Understanding video contents

The reports showed that the subtitles helped the viewers to understand the content. A student said, ‘I absolutely agree that adding captions enables us to more accurately get the information. I find it particularly useful when

some important information is mentioned'. In a report from a student who has special education needs, subtitles can be a big help on enabling viewers to overcome the barriers unintentionally set up by the use of PowerPoint (and other similar presentation aids). It said, 'since I am not able to read the images, PPT or effects shown on the screen for example via share-screen function, it'd be better if those information can be included in the caption bar.'

Besides understanding the content when watching the videos, students also found that subtitles helped them on note taking. 'It's easier for me to take notes and I can also refer to the subtitles for some key terms. As a visually impaired, it's not so convenient for me to take notes while listening to the speaker. When there is subtitle available, I can concentrate on the presentation while when clarification or note-taking is needed, I can refer to the subtitles.' Here comes another report, 'adding captions is effective for assisting self-learning because they help students take notes from the videos more easily. For example, when the instructor talks about different points in expressing opinions appropriately, the captions can help students absorb the methods taught more quickly, without a need to repeat the video.'

6. Keeping pace with the video

Subtitles also give the viewers a peace of mind that the message delivered in the vocal way will also be presented in a written form. 'I think that through adding captions, I have been able to follow up with the pace of the video, and the captions has allowed me to further increase my understanding in the video.'

Even though the video quality is not ideal or the presentation speed is not fitting in all students' need, subtitles play an important role on delivering key messages. 'Sometimes, the audio quality may not be very clear, so it is useful to have captions in order to clarify what the instructor says.' 'I definitely think that adding captions is good for these videos as I find it hard to follow what the speaker is teaching. It allows me to further understand better what is being addressed.' 'It allows me to be able to catchup with what the speaker is saying, it also further encourages me to conduct self-learning.'

7. Aiding second language users

In CUHK, and the whole Hong Kong as well, it is normal to use the all three dominating languages (Cantonese, English, and Mandarin) to communicate even in the same course. Subtitles can be of great help for students watching a video presenting in their second (and more) languages. 'I think that adding these captions is good. As for me, I am not great at Putonghua [note: Mandarin], after being able to read the subtitles while watching the speaker, I was able to better understand what the speaker is saying and catchup. It encourages me to conduct self-learning as I am in a better zone of proximal development as I am not the best in Putonghua. The subtitles allowed me the ability to comprehend the concepts being said more clearly in a more convenient way.'

In tertiary institutes in Hong Kong, English is an essential ability that needs to be mastered. Subtitles can help those who are lagging behind on languages not failing to grasp messages that they are capable to understand if there is no language barriers. 'Caption additions are nice for this type of video because not all students have good English listening skills. To better catch up with the speaker, captions are always helpful. It does assist me to conduct self-learning. For example, there are several sophisticated words that I seldom encounter in daily life like "intuitively". This helps me to save the time of listening over and over again to understand the word and the whole sentence.' The use of language on teaching is never merely about the listeners, the educators played an equally (if not more) important role. 'For the English version the speaker unintentionally slurred on certain words, like "curriculum", "workshops", "participation", "address" and "diverse" which I have to turn on the captions in order to understand what she is saying.'

Here comes the strongest claim on the subtitles on aiding viewers on watching second language videos: 'I cannot catch up if there was no caption.'

There are, however, some comments against using subtitles on some kinds of videos. For videos like introductory videos that 'does not involve the use of jargons', a comment stated 'I think captions here are a bonus, but not necessary'. Therefore, we tend to keep the function that enables the viewers to choose switching on or off the aids.

8. Future development

To further improve the project, it will be introduced to the partners of ILC besides the OSA, such as Office of University General Education, University library system, Colleges etc. Both online and printed promotion materials will be prepared. Department or unit who wants to encourage SEN students in CUHK to take control of their learning by providing suitable supports on eLearning can take reference. Promotion video and information of the project will be uploaded to ILC webpage and other available channels. In terms of reaching out, the design and findings of the effectiveness of this platform will be presented in conferences, workshops, and academic papers. The outcomes and effectiveness of this project will be shared.

9. Conclusion

Adding subtitles and sign language interpretation on the videos is to make the video more accessible to different types of students in university. A function that enables the viewers to choose switching on or off the aids is to raise the learning effectiveness. It can encourage the students to use eLearning in a more effective way and nurture a larger group of self-learners who can learn in their own pace. By the elementary evaluation on the videos available, we can see that students are providing positive feedbacks on subtitles aiding them to raise effectiveness on learning and self-learning.

This paper offers a first-handed and thorough perspective on the whole project of adding subtitles to self-learning videos. This is to share the experience on supporting SEN and general students by making eLearning more accessible. When we are carrying out the project, we plan to further benefit the academia by sharing our successful experience. We believe the aims of the project can be further extended by sharing our experience with our academic peers, that is, our partners.

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