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Video lectures, PowerPoint presentations and the feeling of learning

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Summary
Online video streamed lectures rely heavily on PowerPoint presentations in higher education. Almost all the streamed video lectures have four elements seen from the position of the learner in front of the computer screen: A filmed professor in an auditorium or classroom often photographed in half body or more, a soundtrack with the voice of the professor, a number of PowerPoint slides simultaneously changing and perhaps indexed so that it is possible to jump in the video lecture.

   The PowerPoint slides dominate the online video. They are often seen as the key element – the most important part - of the streamed lecture. In the program setup or media player which is seen by the learner in front of the computer screen the slides fills the main part while the picture of the professor typical is small or smaller. Focus is on the power point slides, then on the audio track and the film with the professor, and finally on the indexation which gives the learner the possibility to choose which slides should be seen (and in addition which audio and film sequence of the videos should be played).

   Power Point slides are used in thousands of classrooms all over the world every day. From here they have spread to the learning room of the streamed video lecture although criticism has been formulated of the role of PowerPoint in learning. Producers of video streaming lectures do not seem to have raised the same question. Is PowerPoint slides added to a video lecture a good idea? Do the students feel that they support the learning? And more important: do they actually support the learning?

   The international PBL master program – Master in Problem Based Learning in Engineering and Science at Aalborg University (http://www.mpbl.aau.dk) – uses online video streamed lectures (1) with PowerPoint slides as learning resource together with videos without slides and other learning resources as discussion forums, online supervision and facilitation, seminars and conventional literature. With the purpose to find out if the PowerPoint slides supports the feeling of learning, a focus group consisting of 20 on campus students (in medialogy) has been asked to see and assess a number of different video lectures from the PBL master program, some with and some without PowerPoint slides added. The results will be presented in this article.

1.   INTRODUCTION

The Master programme in Problem-Based Learning in Engineering and Science, MPBL (www.mpbl.aau.dk), is an online programme offering formalized staff development. The program offers digital videos in combination with other learning resources. It is a concept which offers video as pure presentation but also as an instructional tool and gives the participants the possibility to construct their knowledge, collaborate and communicate.

The programme is online, worldwide and on demand. It recruits participants from all over the world. The programme is organized exemplary in accordance to the principles in the problem-based and project-based learning method used at Aalborg University where students have large influence on their own teaching, learning and curriculum. It is the overall intention with the programme to offer formalized training for changing traditional education into PBL.

3.   STREAMED VIDEO

Streamed video is an integrated element of the learning platform.
There are the following four categories:

1. Live transmission/capturing and re-using of events (lectures, seminars and instructions) *without* PowerPoint slides. Slightly edited.
2. Live transmission/capturing and re-using of events (lectures, seminars and instructions) *with* PowerPoint slides inserted. Slightly edited.
3. Transmissions of fictive events (mini-lectures specially arranged for the media) *with* and *without* slides. Slightly edited
4. Video clips supporting written text.

The main part of the video lectures belongs to category 3. They are filmed with one camera, some with zooming possibility. Others are filmed with a camera without this feature. The zooming possibility allows for variations. In some sequences the object is filmed close up in other sequences further away.

The video lectures in this category are short (10-15 minutes). And they are produced without any students attending the lecture. The lecturer is filmed quite close (a little bit more than just the face – up to the half body) without giving any or only a slight impression of being in an auditorium. The videos are either streamed together with the slides or shown to the left of the slides simultaneously changing. The idea has been to show the person behind the lecture talking to the viewer behind the computer. Some of the videos are made as teaching interviews or unstructured (more or less) monologues. The lecturers are interviewed by a colleague and the questions are cut out in the editing process.

The videos are integrated in the learning platform and are part of a bigger learning environment. They are integrated or supported with texts, discussion forums, chats and video meeting opportunities, virtual rooms for networking, and virtual group rooms for discussion and exchange of viewpoints, study and resource links e.g. to other web-sites

and relevant libraries. Besides that students have ordinary books and articles in a compendium.

The environment is illustrated with the following figure.

Figur 1: Model of the learning environment. Videos are resources in connection with sessions and guest lectures.

The approach behind the environment is constructivism. The participants can choose and access the resources when they want. The videos are learning resources along with other resources. The purpose is to give:

Instructions
Overviews of literature or subject area
Introduction to subject areas
Filling gaps in the literature or other resources
Perspectives
Illustrating texts (redundancy as film or commentary)

The advantage for the participants is that they can view the videos again and again. (It is not special or extraordinary. Books and articles can also be read more than once). Events can be recorded and viewed on demand. This is important because the master programme is international and different time zones do not make live broadcasting obvious.

4.   USE AND NONE USE OF POWERPOINT

Video lectures can be defined as a genre within video teaching. Characteristic for the genre is the position of the professor where he or she addresses the audience in an academic way – e.g. in front of a black- or whiteboard, in an auditorium or behind a desk. Central is the use of PowerPoint slides changing simultaneously – to the audio and the filmed video of the professor. The form is well-known from classrooms and universities all over the world where lecturing has been almost the same as running a PowerPoint teaching show or presentation in front of a large group of students.

Almost uncritically the form has been applied and adopted by commercial and non-commercial producers of video lectures including professors streaming lectures on their own.

But do the PowerPoint slides in a video lecture help the learner to learn? Or would the learner be better helped without the slides added.

The online learner behind the computer screen – is in a difficult situation watching a session with a video, listening to the sound track and watching slides simultaneous changing. In between the leaner might take notes. Eyes and ears are continuously stimulated. On the other hand the leaner can stop the video and take notes. Or can see the video once again. Or with the help of the index jump around in the video and take parts of a session once again.

But perhaps the learner was better helped with fewer stimuli and a video which demands the full concentration off the learner at the filmed message. And with the learner taking notes of her own. Perhaps an unstructured learning interview would serve the learner better than a well structured lesson with well structured PowerPoint slides?

The usefulness of PowerPoint in presentation and learning has been questioned. Tufte has launched a heavy critique of PowerPoint and the use of slides made by the program (Tufte 2003). One point of criticism was that the program degrades the communication of information. It forces the user into information structures which separate content and analysis reduces concepts to bullets without any meaning. The use of the program and slides also enforce strict hierarchies which disguise important information.

Under the headline *Bullet Outlines Dilute Thought* Tufte states that the bullets ignore and conceals the causal assumptions and analytic structure of the reasoning. For the naïve bullets may create the appearance of hard-headed organized thought. But the stile is faux-analytical.

PowerPoint bullets outlines corrupt thought but may help disorganized speakers get them selves organized. But in scientific and engineering analysis they are far from optimal. Bullets accommodate the generic, superficial and simplistic. Data thin displays tend to make audience passive and feel boring.

Slides are also of very low resolution because of the impoverished space. It leads to over-generalizations, abrupt and thinly-argued claims, imprecise statements and lightweight evidence.

Slides has much lower rates of information than the speak that accompany the sides. Because the space is limitated with little information on each slide it leads to many slides. "When information is stacked in time, it is difficult to understand context and evaluate relationship", (Tufte 2003, 4). The use of designated style sheets with the name of the presenter and a logo on each slide forces the limitations of information compromising the professor, the content and the learner.

Watching slides is compared to watching television. Slide transition – information quickly appearing and disappearing in sequences – is an event that attracts attention to the presentations compositional methods. In restless one-way sequences the slides contains small amounts of vanishing information. The signal/noise ratio of the slide format and the presentation technology is bad compared to other methods of communication. The use of PowerPoint on computer screens mediated by the internet is called pollution.

Tufte writes:
"The core ideas of teaching – *explanation, reasoning, finding things out, questioning, content, evidence, credible authority not patronizing authoritarianism* – are contrary to the hierarchical market-pitch approach" (Tufte 2003,13)

In stead of slides for serious presentation Tufte prefers high resolution paper handouts because they allows the viewer to contextualize, compare, narrate and recast evidence. He thinks it's helpful to provide viewers with at least one mode of information that let them control the order and pace of learning – unlike slides and unlike a professor lecturing. And in a text beneath one of his illustration he sums up: "Text, imaging, and data for scientific presentations should be at the level of scientific journals, much *higher* resolution than speech" (Tufte 2003, 19). PowerPoint is for "showing low-resolution colour images, graphics, and videos that cannot be reproduced as printed handouts at a presentation" (Tufte 2003, 24)[2].

With the help of cognitive load theory similar conclusions are reached. According to the theory of cognitive load and multimedia learning there exists a challenge of overloading the learner's cognitive capacity. The human mind separates information in two "channels". One for verbal and one for visual input. Both "channels" has a maximum loading capacity. Leaning requires substantial cognitive processing in both "channels" but only a limited number of cognitive processes can take place at the same time (Mayer and Moreno, 2003; Sweller, 1999).

In multimedia learning five cognitive processes are required: selecting words, selecting images, organizing words, organizing images, and integrating. The processes may exceed the processing capacity of the cognitive system. The result is overloading it. When the learners visual attention is split between viewing for instance a film with a professor lecturing and reading an on-screen text which is the case in many video lectures with the combination of the filmed professor and the added PowerPoint slides then the cognitive

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[2] Critique of Tufte has been summed up by Fox and Cueva, 2004 and Atkinson, 2004. I will not go into the discussion here.

system of the learners will be overloaded. The learner's visual attention is split between viewing the animation and reading the on screen text.

The solution could be to support the spoken presentation with relevant visuals instead of repeating or summarizing information from the presentation in text. Another solution could be to keep the slides simple to avoid stressing the viewer. It could also be providing clues in heading to promote active cognition. (Fox and Cueva, 2004). It could also be to avoid the redundancy effect by removing the redundant source (Cooper, 1998) e.g. drop the slides totally because students understand a multimedia presentation better when words are presented as narration rather than narration and on-screen text (Mayer and Moreno 2004). But Sweller is (Patty, 2007) on the same line as Tufte: "The use of PowerPoint presentation has been a disaster. It is effective to speak to a diagram, because it presents information in a different form. But it is not effective to speak the same words that are written, because it is putting too much load on the mind and decreases your ability to understand what is being presented." Notes taken or handouts are preferred otherwise the leaner will be split between slides and a verbalization of the same content (UNSM, 2007)

5.   DEVELOPING THE VIDEO LECTURE
When developing the video lecture as a genre it is important to find a form which makes the students feel that they learn (not to be mixed up with actual learning which is important as well). If the learner do not feel that he or she is learning then it is easy to cancel the video and stop the online learning. If the feeling of learning is absent then the learner is not motivated to continue and learner will cancel the video and stop the learning process. The same is likely to happen if the learner feels boring and cannot keep attention.

It is not a good idea to develop the form into a direction which does not satisfy the students feeling of learning. It is not a good idea to use slides if they do not support the feeling of learning.

A group consisting of 20 on campus students has been asked to evaluate three different lectures used in the programme and two produced as an experiment for the occasion of the testing – some with slides and some without. It is

1. video lecture, with structured text slides (with bullets) changing simultaneously - with indexation
2. pure video lecture – same as 1. but without slides and indexation
3. video lecture, with slides showing images changing simultaneously - with indexation
4. unstructured lecture interview without slides
5. lecture, partitioned - video without slides
(For details see appendix)

The 5 forms are illustrated below:

Figure 2: Video lecture (1), The professor inserted to the left, beneath the indexation and slides changing simultaneously to the right.

Figure 3: Video lecture (2), The professor is filmed half body/close up, fills the screen in the player talking to the learner. No slides are added forcing the leaner to focus on the professor. This type is produced only for testing and is not used by the MPBL program.
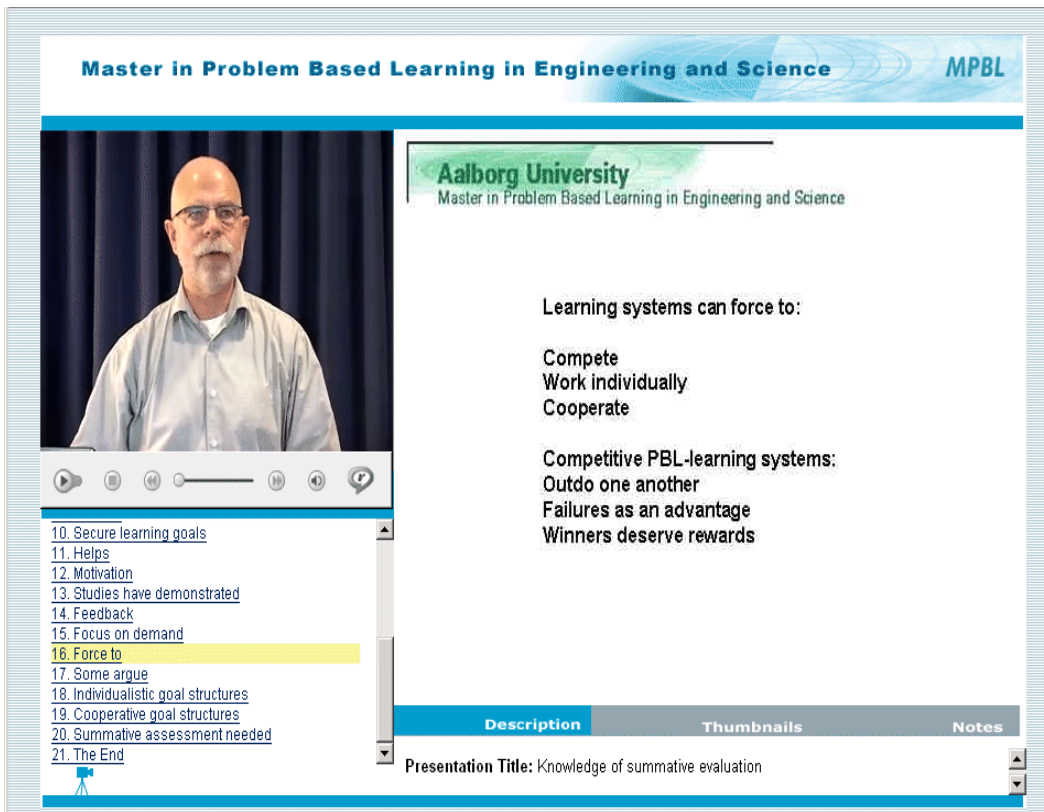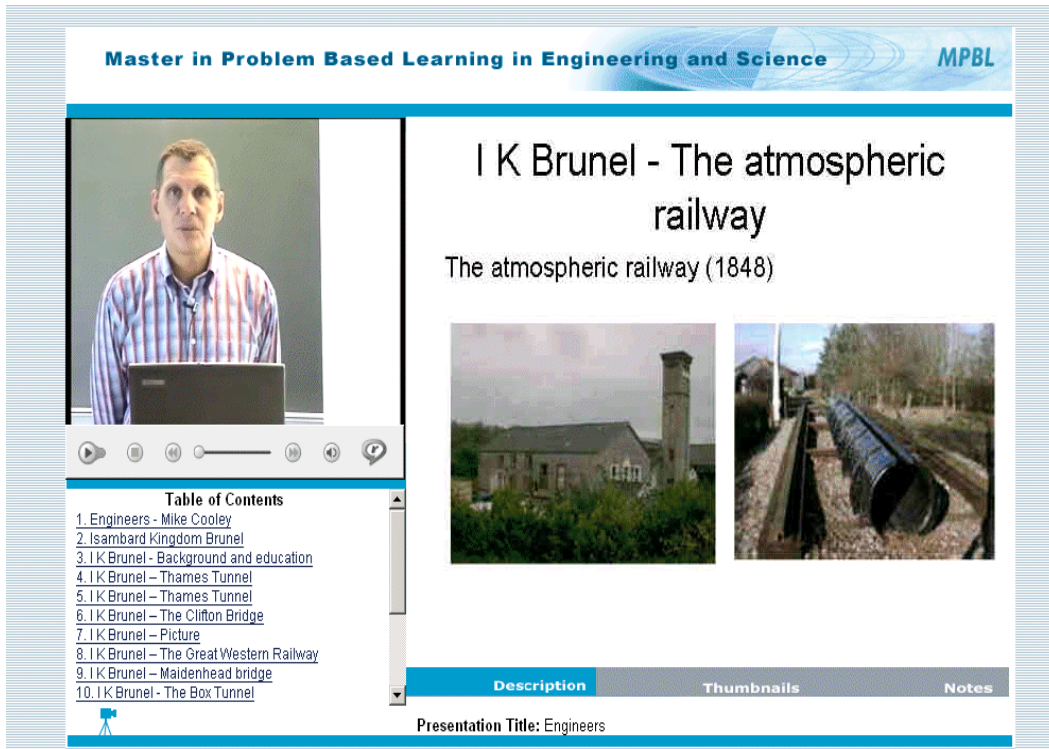
Figure 4: Video lecture (3), The professor inserted to the left, beneath the indexation and slides changing simultaneously to the right - the slides filling the main part of the screen. The lecture is mainly narrative around one or two images at each slides and only a little amount of text added.

Figure 5: Unstructured video lecture interview (4). The professor is filmed in a non lecturing position closer than half body, seen from the side, talking to the camera or looking outright. No slides are added forcing the leaner to focus on the professor.

Figure 6: Video lecture, partitioned (5). The video is partitioned in many sequences. Each sequence begins with a text frame with the title of the subject followed by a short filmed sequence (e.g. 60 sec.) with the professor explaining the subject. The professor is filmed in a semi-lecturing position close up, talking to the camera. No slides are added forcing the leaner to focus on the professor. This type is produced only for testing and is not used by the MPBL program.

6.   RESULTS

Before assessing the videos the students were asked to take a learning style test developed by Felder, Silverman and Soloman (Felder, Silverman and Solomon, no year; Felder and Solomon, no year). The approximate score was 6,85 (See Table 1) which means in favour of a visual learning style (versus a verbal learning style) remembering best when they see pictures, diagrams, flow charts, time lines, films, and demonstrations. A score between 5 and 7 means a moderate preference for that dimension and the student will learn more easily in a teaching environment which favours that dimension.

TABEL 1: Score in Learning Style Test

```
              Result=6,85
VIS           11  9   7   5   3   1   1   3   5   7   9   11 VRB
                                  <-- -->
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Score 1-3: Well balanced on the two dimensions of that scale.
Score 5-7: Moderate preference for one dimension of the scale.
Score: 9-11: Very strong preference for one dimension of the scale.
http://www.engr.ncsu.edu/learningstyles/submit.php

After seeing the videos the students were asked to answer the following 3 questions.

1. Which form do you feel is best for your learning?
2. Which form do you feel is best keeping your attention?
3. Which form do you prefer?

The students were told to give 5 points to the one they felt were the best for their learning, the best to keep their attention and the one which they preferred. They should give 4 point to the next best, 3 to the third and so on. They should use all the points from 1 to 5 without using the same twice. The method used forces the students to assess the lectures relative to each other even if they value them equal. The results are shown below.

Table 2: Distribution of grades

Question 1: Which form do you feel is best for your learning?

1. Lecture/bullets slides	4	1	2	3	4	5	4	3	2	2	4	3	4	1	4	5	5	3	3	1
2. Lecture/no slides	1	3	4	2	1	1	1	4	4	4	3	4	3	4	5	3	4	1	1	5
3. Lecture/image slides	5	2	5	5	5	4	5	2	5	5	5	5	5	5	2	4	3	2	5	4
4. Lecture interview	3	4	3	4	3	2	2	1	1	3	1	1	1	2	1	2	1	5	2	3
5. Lecture, partitioned	2	5	1	1	2	3	1	5	3	1	2	2	2	3	3	1	2	4	4	2

Question 2: Which form do you feel is best keeping your attention?

1. Lecture/bullets slides	4	1	4	4	4	4	4	3	2	1	4	2	3	1	4	4	4	1	4	1
2. Lecture/no slides	1	2	1	1	1	2	2	4	4	2	3	4	4	5	5	3	5	2	2	3
3. Lecture/image slides	5	4	2	5	5	5	4	2	5	5	5	5	5	4	3	5	3	4	5	4
4. Lecture interview	3	3	5	3	3	3	2	1	1	3	1	1	1	3	2	2	1	3	1	5
5. Lecture, partitioned	2	5	3	2	2	1	1	5	3	4	2	3	2	2	1	1	2	5	3	2

Question 3: Which form do you prefer?

1. Lecture/bullets slides	4	1	5	4	2	5	4	3	2	3	4	3	4	1	4	5	5	1	4	1
2. Lecture/no slides	2	3	3	1	1	1	2	4	3	2	3	4	3	5	5	3	3	3	3	2
3. Lecture/image slides	5	4	1	5	5	4	5	2	5	5	5	5	5	4	1	4	4	2	5	4
4. Lecture interview	3	2	4	2	3	3	2	1	1	4	1	1	1	2	2	2	1	4	1	5
5. Lecture, partitioned	1	5	2	3	4	2	3	5	4	1	2	2	2	3	3	1	2	5	2	3

As indicated in table 1 it is difficult to determine which form is best. Some forms score higher by some students. The grading made by the students is not equal when it comes to details. The students graded the productions very differently, hardly two are equal. The partitioned lecture and the lecture interview are graded low (1 point) by more students. But

3 and 4 points is also between. The highest ranked video clips (the lecture with image slides) do also score low (1 and 2 points) between some students.

Table 3: Distribution of score 1 point, number of students

Question 1: Which form do you feel is best for your learning?	
1. Lecture/bullets slides	3
2. Lecture/no slides	6
3. Lecture/image slides	0
4. Lecture interview	7
5. Lecture, partitioned	5
Question 2: Which form do you feel is best keeping your attention?	
1. Lecture/bullets slides	5
2. Lecture/no slides	4
3. Lecture/image slides	0
4. Lecture interview	7
5. Lecture, partitioned	4
Question 3: Which form do you prefer?	
1. Lecture/bullets slides	4
2. Lecture/no slides	3
3. Lecture/image slides	2
4. Lecture interview	7
5. Lecture, partitioned	3

12 students felt that the lecture with image slides was best for their learning while 3 felt that it was the lecture with the bullet slides and 2 felt that it was the lecture with no slides and the partitioned production. Only 1 felt that the lecture interview was the best.

If 4 and 5 points are defined as a score which indicate what the students think is best for their learning then the lecture with image slides, the lecture with bullets slides and the lecture without slides is valued highest by the student when it come to the question "Which form do you feel is best for your learning? 3 and 4 students' gives lecture interview and the partitioned production 4 or 5 points.

The lecture with slides is the best form to keep the attention at most of the student. 16 students give the lecture with image slides 4 or 5 point, while 11 students give the lecture with bullet slides 4 or 5 points. The lecture with image slides is given 5 points by 11 students while the lecture with bullets slides is given 5 points by no students.

Most of the students prefer the form used in the lecture with image slides. 10 students give this form 5 point. The lecture with bullet slides is number two with 4 students giving 5

points. 3 students prefer the partitioned lecture production, 2 the lecture without slides and 1 the lecture interview.

Looking at 4 and 5 point together equalises the 2 productions with slides more when it comes to the question of what the students prefer. 16 students give the lecture with image slides 4 or 5 points, 11 the lecture with bullet slides.

The overall result of the grading – the ranking - of the productions are seen in chart 1-3 below.

Chart 1
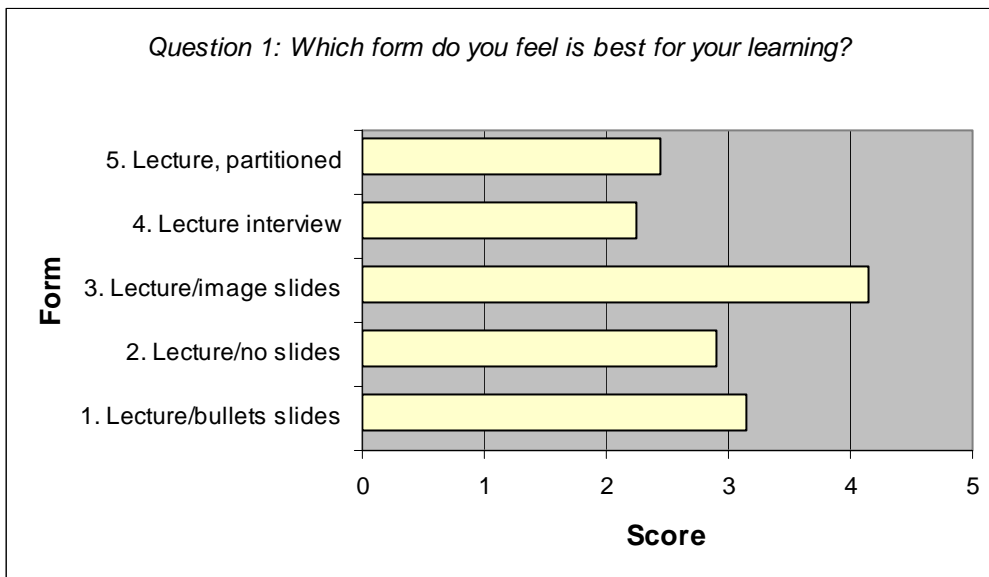
As seen in the chart 1 the lecture with mage slides is ranked highest between the students when it comes to the question of which form they feel is best for their learning. The lectures without slides get the lowest score between the students. Almost similar results are seen in chart 2. The students rank the lecture with image slides highest when it comes to the question of which form is best to keep their attention. Keeping attention is an important parameter in learning. The lecture with bullets slides and the (same) lecture without slides are ranked almost equal when it comes to keeping attention.

Chart 2:

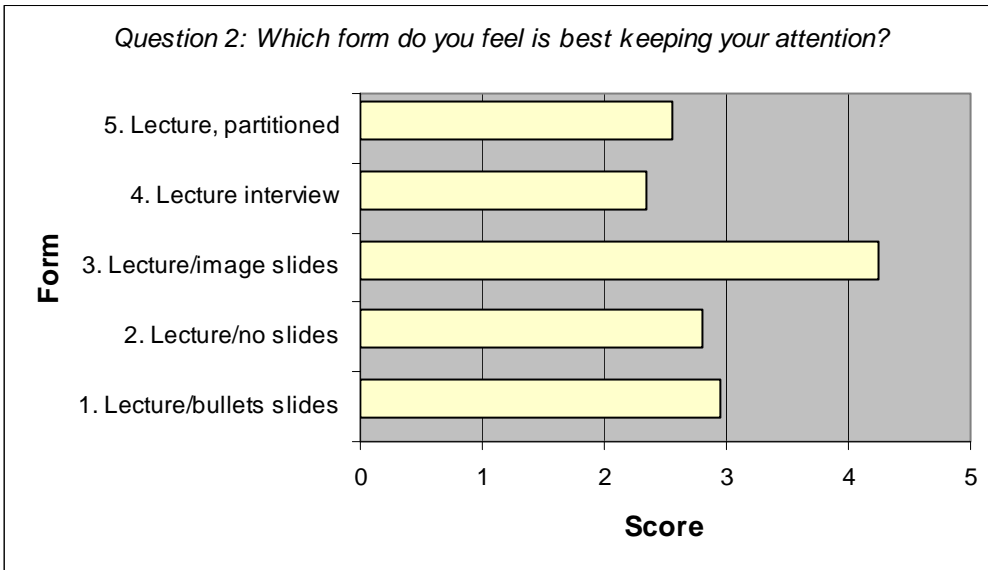Question 2: Which form do you feel is best keeping your attention?

Chart 3 shows the results from the last question. The highest rank is again given to the lectures with slides added. The lowest to the lecture interview. The difference in score between the lecture with bullet slides, the partitioned production and the lecture with no slides are not very significant.

Chart 3:

Question 3: Which form do you prefer?
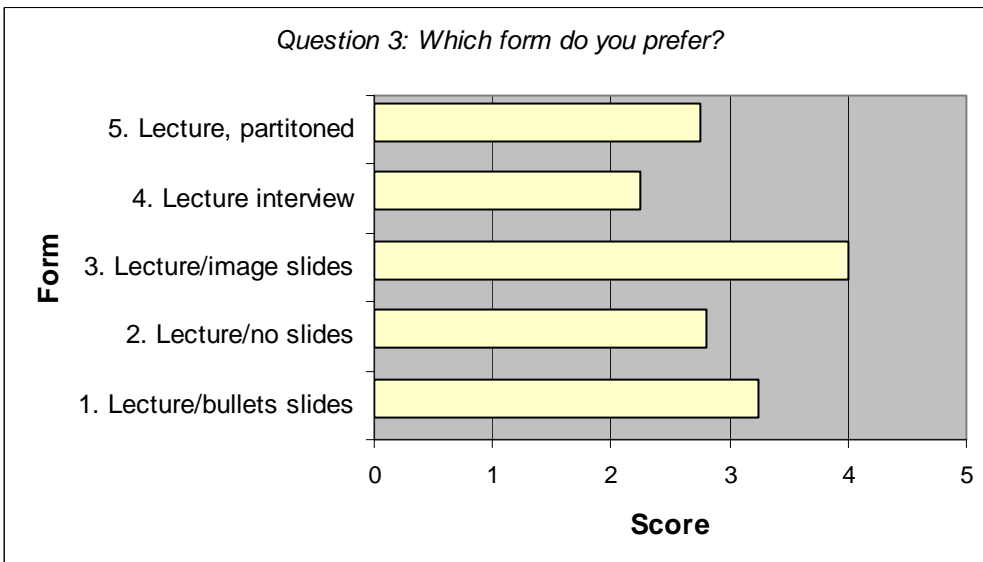
7.   CONCLUSION

The students in the focus group had a moderate – in the upper end - preference for visual learning.

The survey showed great difference between how the lectures are valued by the students. Hardly any student grades the lectures in the same way. The feeling of learning, of keeping attention and preferring forms are very individual.

On the other hand it is possible to say that some student's felt that some of the presentations were better than others.

The video lecture with image slides added got the highest overall grading. The lecture with bullet slides and the lecture with no slides were nearly graded equal. The partitioned lecture could be said to belong to this group although graded lower than the two others. The lecture interview was always lowest ranked.

38% of the students ranked the lecture with image slides highest – giving 4 or 5 points when it came to the question of which form they did feel best for their learning. 23% thought that it was the lecture with bullet slides and the lecture without slides.

The lecture with image slides added was valued as the best form to keep the attention of most of the students, 40% of them gave this production 4 or 5 points. 28% gave the lecture with bullet slides 4 or 5 points.

The form used in the lecture with image slides is preferred by most of the students, 40% gave 4 or 5 points to this form. 50% of the students gave it 5 points.

In relation to the findings and viewpoints by Tufte it can be concluded that lectures with image slides are valued higher than slides with bullets by some students, but not all. Slides with bullets are also valued high although by fewer. Interesting is also that lectures with slides bullets are valued equal to lectures with no slides added.

Related to the cognitive load theory referred some of the findings are surprising. That lectures with image slides are valued high is not that surprising. The visual channel is not overloaded. According to the theory lectures with bullet slides could have been expected to be valued lower and productions without slides – the lecture without slides, the lecture interview and the partitioned lecture – only using one channel could be expected to be valued higher.

20 students is a small population. Bigger populations and participants with other learning profiles might give other results.

8.   APPENDIX

1. Lecture with bullet slides: A fictive filmed event in a studio with no student attending the seminar. The lecturer is filmed half body and mixed together with the slides with the help of PresenterOne from Accordent Technologies. On the computer screen the viewer sees the changing slides and inserted to the left the filmed lecturer as a "talking head". The lecturer looks at the viewer behind the computer screen. The idea is that the viewer should feel that the lecturer is talking to him or her but the main focus should be on the slides changing simultaneously. The viewer can use the indexation and the facilities in the media player to change the dimensions of the slides and lecturer. The duration of the lecture is approx. 16 min. The 21 slides are structured with bullets and mainly a small amount of text.

2. Lecture without slides: As video 1 except the lecturer are filmed a little closer than half body. No slides are added. It has not been used by the MPBL program.

3. Lecture with image slides: A fictive filmed event in a seminar room with no student attending the seminar. The lecturer is filmed half body and mixed together with the slides with the help of PresenterOne from Accordent Technologies. On the computer screen the viewer sees the changing slides and inserted to the left the filmed lecturer as a "talking head". The lecturer looks at the viewer behind the computer screen. The idea is that the viewer should feel that the lecturer is talking to him or her but the main focus should be on the slides changing simultaneously. The viewer can use the indexation and the facilities in the media player to change the dimensions of the slides and lecturer. The duration of the lecture is approx. 9 min. The 17 slides are with one or 2 images at each and little text.

4. Lecture interview: A filmed unstructured interview in a seminar room in front of a blackboard with no students attending. The lecturer is filmed half body and sitting partly with the side to the camera. The duration of the lecture is approx. 16 min. No slides are added forcing the learner to concentrate on the narration of the professor.

5. A lecture partitioned in sequences (like e.g. a music video) marked by text introducing the subject. The professor is filmed close-up with focus on the learner to whom he is talking. No slides are added. The video consist of 14 sequences and the duration of the video is approx. 12 min. It has not been used by the MPBL program.

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