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The influence of the instructor's visibility in an instructional statistics video on student's perceived social presence, anxiety, and performance

Master Thesis

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Contents

Abstract

This study investigated the influence of the instructor's visibility in an instructional statistics video on student's perceived social presence of the instructor, anxiety toward statistics, and statistical performance. Furthermore, the relationship between perceived social presence and anxiety towards statistics was investigated. Previous research has shown that anxiety can negatively impact students' performance, but in a traditional classroom setting the instructor can decrease the level of anxiety through social cues such as eye contact and smiling. Instructional videos can be designed to include a shoulder-up view of the instructor so that social cues can be incorporated to imitate the classroom setting. The participants of the study were 66 pre-master students enrolled in the course inferential statistics. The participants were assigned to one of two groups, either to the group which viewed an instructional statistic video *with* the instructor being visible or to the group viewing an instructional video *without* the instructor being visible. The results found that the visibility of the instructor had a positive effect on perceived social presence and anxiety. This suggest that the visibility of the instructor can lead to increased social presence and decreased anxiety. Therefore, the inclusion of the instructor could be utilized to reduce students' anxiety levels. However, no relationship was found between perceived social presence and anxiety toward statistics, nor was there a difference between the conditions, in performance level. This finding suggests for future research to investigate different levels of social cues and whether these could have an effect on students' performance.

Keywords. instructional video, instructors' visibility, anxiety, social presence, performance

Introduction

Statistics is a very complex subject, that is perceived by many students as difficult (van der Meij and Dunkel, 2019). It involves gaining knowledge about concepts, theories, and formulas, gathering information, processing data, and interpreting the results (van der Meij and Dunkel, 2019, Cruise et al. 1985). Nonetheless, statistics is for most social science graduate students a mandatory subject within their study program, that cannot be skipped (Zeidner, 1991). This makes statistics an anxiety evoking subject for many students and creates negative attitudes toward the subject (Chew & Dillon, 2014; Devaney, 2010, Onwuegbuzie, 2000).

On the one hand, anxiety is a stable personality characteristic (trait anxiety) which is in some individuals more prevalent than in others, thus some people are generally more anxious than others (Eysenck, 2007). On the other hand, anxiety is a physical and cognitive reaction experienced because of a specific situation (state anxiety; Eysenck, 2007). For many students, statistics at the university level is such a situation (Onwuegbuzie, 2000; Chew & Dillon, 2014). Onwuegbuzie and Wilson (2003) state that up to 80 per cent of graduate students experience anxiety toward statistics. This incorporates feelings of inadequacy, low confidence and often leads to lower performance (Blalock, 1987; Dillon, 1982). Furthermore, anxiety toward the subject leads to higher levels of procrastination and even to delaying the enrollment in the course (Onwuegbuzie, 2004).

In a traditional classroom setting, where face-to-face interaction occurs, positive verbal and non-verbal communication cues sent by the teacher have been identified as a method that can decrease statistics anxiety among students (Kelly et al., 2015; Williams, 2010; Tonsing, 2018). However, today education does not only occur in traditional classroom

settings. Online education for example, through massive open online courses (MOOCs), has been expanded over the years and reached millions of people (Baker, 2010; Kizilcec, Bailenson, & Gomez, 2015). Also, universities have started to create short instructional videos including videos for statistics to address the complexity of the subject (van der Meij and Dunkel, 2019).

These new technologies come with their own opportunities. For example, in regard to anxiety, a beneficial feature of videos is, that they can be reviewed in the comfort of students' homes before or after class. Furthermore, these videos can be paused and watched at any time and therefore give students the opportunity to process the content at their individual speed (van der Meij and Dunkel, 2019). Bandura (1988) states that a feeling of control over a threatening situation plays a key role in anxiety arousal. Hence, the feature of controlling the pace at which the information is consumed, which instructional videos have, might help students to perceive that they have more control over their statistical learning process and assist in managing their anxiety.

Contrarily, traditional communication cues lack in online education and online learning is often perceived as low in teacher presence (Garrison, 2007; Tu & McIsaac, 2002). To overcome this challenge various measures are taken, including offline meeting hours, feedback, or discussion forums to enhance perceived social presence and student engagement (Wang & Antonenko, 2017). One frequently used strategy to address this issue is the inclusion of the instructor in the educational video. Many of the videos created by universities are simulating the traditional classroom setting, showing the instructor in front while presenting the learning content in the back (talking head). Others include the instructor as a picture-in-picture imagine within the frame. Also, many massive open online courses (MOOCS) make use of these formats which include the instructor (Ilioudi, Chorianopoulos &

Giannakos, 2016). However, the production costs are quite high for some of these video formats (Wang & Antonenko, 2017).

The theoretical implications and the empirical evidence for the decision to incorporate the instructor are mixed (Wang & Antonenko, 2017). The theory of multimedia learning, for example, suggests that people do not learn more deeply when the instructor is visibly incorporated in the instructional video (Mayer & DaPra, 2012; Mayer, Dow & Mayer, 2003). However, it is important to note that these studies are based on educational agents and not real humans. What seems apparent in other studies is that the incorporation of an instructor enhances students' engagement and attitudes towards the subject (Wang & Antonenkon, 2017). Moreover, there are several studies, which investigated the role of the instructor on students' anxiety levels. These studies suggest that certain behaviors of the instructor (e.g., smiling and eye contact) if perceived positively can reduce students' anxiety levels (Chesebro, 2003; Chesebro & McCroskey, 2001; Tonsing, 2018; Williams, 2010). Williams (2010) gives the possible explanation that verbal and non-verbal communication cues can function as "safety signals", helping students to perceive the situation as less frightening than expected and therefore reducing anxiety over time. However, these studies were conducted in traditional classroom settings, but based on the social presence theory it is possible to send and perceive social cues through communication media (Garrison et al, 2000; Sort et al, 1976)

The current study examined the influence of the instructor's visibility in an educational statistics video on students' perceived social presence of the instructor, anxiety levels towards statistics and the statistical performance of the viewers, as well as the relationship between perceived social presence and anxiety toward statistic. Students watched either a pencast video with handwritten step-by-step explanations and a voice-over narration

by the instructor, or a pencast video with the same handwritten explanations but including a shoulder-up view of the instructor giving the explanations. The incorporated view of the instructor allowed observing the facial expressions of the instructor.

Theoretical Framework

Social Presence and multimedia learning

The theory of social presence initially came from the telecommunication field (Short, et al., 1976). The theory is built upon the idea that communication media differ in the way they transmit social presence, some media for example transmit more information on social cues and therefore influence the interaction between the two communicating (Cobb, 2009). In the book "The social psychology of telecommunication", Short, et al. (1976) define the concept of social presence as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships". Furthermore, two main concepts are used, intimacy and immediacy. Intimacy describes the closeness between the two communicators and is influenced by physical distance, eye contact, proximity, and the topic of conversation (Argyle & Dean, 1965). Immediacy describes the psychological distance between the two who communicate (Wiener & Mehrabian, 1968), it is conveyed through verbal and non-verbal cues (Tu, 2000). Immediacy increases social presence (Gunawardena & Zittel, 1997).

Initially, Short et al. (1976, p.65) described social presence as a quality of the medium itself (e.g., TV is higher in social presence than a radio because facial expressions can be observed). Later, researchers redefined the concept by focusing on the perception of the recipient (Swan & Shih, 2005). Gunawardena (1995) later redefined social presence as "the

degree to which a person is perceived as a "real" person in mediated communication" (p. 151).

Today, the term social presence is frequently mentioned in the literature about online education, and it is regarded as an important concept (Tu, 2000). Traditional communication cues are often missing in online education, that is why researchers try to find methods to increase social presence (Tu &McIsaac, 2002), often the research focuses to stimulate learning and improved performance (e.g., Mayer, 2014; Kizilcec, Bailenson, & Gomez, 2015). There are two main factors in which learners can be influenced to increase their learning outcome in multimedia learning. The first is designing multimedia learning material in a way that reduces cognitive load, the second is to design multimedia learning material that motivates students to engage in active cognitive processing. Social presence is believed to influence the latter. Moreno and Mayer (2004) suggest that social cues stimulate the feeling of social presence. Furthermore, the integration of social cues in multimedia learning material evokes a social response in the learner, by trying to make sense or creating meaning out of what the speaker has said (Mayer, 2014). The underlying assumption is that there is an implicit agreement between the two people who communicate. The speaker tries to transmit information accurately while the listener puts effort to process the information and truly understand it (Grice, 1975). This increases the active cognitive processing and will lead to higher quality learning (Mayer, 2014).

Several design features have been introduced by researchers to increase the sense of social presence in online learning. Mayer (2014) for example introduced the personalization, voice, embodiment, and image principle. The personalization principle states that a conversational style of speaking leads to deeper learning compared to a formal style of speaking, the voice principle states that a human voice is superior to a computer generated

one and the embodiment principle states that humanlike gestures and movements of an educational agent are preferred over non-human like movements. These principles are quite clear, whereas the image principle is rather unclear. It states that the speaker's image does not necessarily need to be shown to increase the learning outcome. However, the principle is mainly based on pedagogical agents and not real humans (Lusk and Atkinson 2007; McLaren, De Leeuw & Mayer, 2011).

Other researchers have identified features to improve learning by creating a sense of social presence of the teacher. These include video recordings from the first-person view (Fiorella, Van Gog, Hoogerheide, & Mayer, 2017), drawings by hand (Fiorella & Mayer, 2016), showing the face of the instructor (Kizilcec, Bailenson, & Gomez, 2015) or eye contact with the instructor (Beege, Schneider, Nebel, & Rey,2017). However, a frequent feature for instructional videos remains the inclusion of the instructor in the video format (Kizilcec, Bailenson, & Gomez, 2015).

Anxiety

Emotions consists of a physical and a cognitive component (Liebert & Morris, 1967). The physical component of anxiety is automatic physical arousal and the release of certain hormones. However, these physical signs are also prevalent in other emotions such as excitement (Frankenhaeser, 1975; Levi, 1972; Patkai, 1971). Thus, it is the cognitive component which determines what kind of emotion is experienced (Bandura, 1988; Schachter &Singer, 1962). The cognitive component of anxiety is worrying, such as, thinking about one's performance, negative self-evaluation and expected negative outcomes.

Worrying can be viewed as a task-irrelevant cognitive activity, which takes space within the working memory and therefore, negatively impacts performance (Eysenck, 1979).

Working memory is limited in its ability to hold information, only about seven items can be held at a time (Miller, 1956). When it comes to processing information actively, thus structuring, organizing, comparing then only two to three items can be dealt with simultaneously (Sweller, 1998).

The underlying assumption here is that the cognitive activity of anxiety namely worrying will compete with task relevant information on working memory capacity (Eysenck, 1979). Individuals, who experience anxiety while conducting a cognitively demanding task are in a dual-task situation, attention is given to worrisome thoughts and how to cope with them and simultaneously attention is given to the task relevant information, ultimately this will lead to impaired performance (Eysenck, 1979).

Furthermore, anxiety can be better understood based on its occurrence. Anxiety can occur as a preposition to respond to various situations in a specific pattern, (Endler & Kocovski, 2001). In other words, it is a quiet stable personality characteristic, which is assessed by asking questions about how a person feels in general and is therefore labeled as trait anxiety (Cattell, 1966). Anxiety can also occur in specific situations (e.g., participation in an exam), this is labeled state anxiety. State anxiety incorporates next to the situational factors also the underlying trait anxiety as a determinant. It is assessed by asking questions about how a person feels "right now" (Marteau & Bekker, 1992). It is expected that state anxiety is more predictive of performance than trait anxiety, as it entails the disposition of anxiety as a personality trait as well as the external factors experienced in that given moment (Eysenck, 1979).

The negative relationship between anxiety and academic performance has been shown through various research. Sridevi (2013), found in a study with 180 participants from a higher secondary school that a negative correlation between anxiety and academic achievement

existed. Rana and Mahmood (2010) found a negative correlation between anxiety and achievement in a study with 414 students in the postgraduate level from various academic fields. The study revealed that worrying, the cognitive component of anxiety (e.g., fear of failure, pressure to score high) contributed greatly to the level of anxiety. Also, Steinmayr, Crede, McElvany and Wirthwein (2016) found in a study with 290 high school students that high levels of worrying predicted lower achievement.

The instructor can play an important role in reducing anxiety among students, as instructor immediacy thus positive verbal and non-verbal communication cues have been identified as anxiety reducing (Chesebro, 2003; Chesebro & McCroskey, 2001; Tonsing, 2018). This is also the case for statistics as Williams (2010) found that in classroom statistics anxiety of graduate students can be reduced through verbal and non-verbal social cues, such as using humor, smiling, or using the students' name. Tonsing (2018) found similar results for social work students.

Even though computer mediated communication differs from face-to-face communication, it is still possible to transmit social cues through the communication media. Therefore, it is interesting to investigate whether the visibility of the instructor has an effect on perceived social presence, state anxiety and performance within the context of statistics.

Research Question

The aim of this study was to investigate if the instructor's visibility in an educational statistics video had an impact on student's perceived social presence, state anxiety and performance.

1. What is the effect of the instructors' visibility in an instructional statistics video on students' perceived social presence toward the instructor within the video?

2. What is the effect of the instructors' visibility in an instructional statistics video on student's anxiety level toward statistics?

3. Is there a relationship between perceived social presence and anxiety toward statistics?

4. What is the effect of the instructors' visibility in an instructional statistics video on students' statistical performance?

The guiding Hypotheses were:

1. The visibility of the instructor will lead to higher levels of perceived social presence of the instructor.

   Social presence is the" degree of salience of the other person "(short et al, 1976, p.65) or in other words, if a person is perceived as "real" (Gunawardena & Zittle, 1997). The view of the instructor will give the opportunity to associate a face to the voice and process facial expressions. Thus, more social cues are presented and can be processed to get an impression of the instructor.

2. The visibility of the instructor will decrease the anxiety level of students toward statistics.

   The inclusion of the instructor in the instructional video allows for observing body language and facial expression. Research has shown that in a face-to-face classroom setting the instructor can reduce students' anxiety toward statistics using verbal and non-verbal social cues (William, 2010). It is expected that the effect can also be achieve through an instructional video.

3. There will be a negative correlation between perceived social presence and state anxiety.

   Based on the theoretical framework, verbal and non-verbal communication cues can increase social presence (Gunawardena & Zittel, 1997). Positive received

communication cues also have been identified as anxiety reducing (Williams, 2010; Tonsing, 2018). Therefore, it is expected that increased social presence will also lead to decreased anxiety.

4. The visibility of the instructor will have a positive effect on the student's statistical performance.

Previous research by Ilioudi, Chorianopoulos & Giannakos (2013) found that participants viewing an instructional video including a view of the instructor led to better learning than a video without an instructor being visible. Other research by Kizilcec, Bailenson and Gomez (2015) found that students self-reported a better learning experience when watching an instructional video showing the instructor compared to those watching a video without an instructor.

Methods

Research Design

This study aimed to investigate whether the visibility of the instructor had an effect on student's perceived social presence of the instructor, state anxiety and the statistical performance. A quantitative experimental research design with two conditions was chosen. One condition showed a pencast video in which the learning content was illustrated step-by-step in a handwritten style with a voice-over narration by the instructor. The other condition showed the same pencast video but included a shoulder-up view of the instructor in the right bottom corner. The independent variable of this research was the visibility of the instructor in the statistics videos, the dependent variables were anxiety toward statistics, the perceived social presence of the instructor and statistical performance. Anxiety toward statistics was measured on a seven-point Likert scale at two points in time (pre/post-test). The perceived social presence of the instructor was also measured on a seven-point Likert scale after the

students watched the video. Student´s statistical performance was investigated through a written test consisting of two open questions.

Participants

In this experiment 66 students participated from the University of Twente. Students ranged in age from 20 to 42 years (31 males, 35 females; M (age) = 23.71, SD = 4.126). All participants were pre-master students from the faculty of behavioural management and social science. The participants were randomly assigned either to the condition which included the instructor in the instructional video (18 males, 13 females; M (age) = 23.55, SD = 3.793) or to the condition which excluded the instructor from the instructional video (13 males, 22 females; M (age) = 23.85, SD = 4.459). The participation in the study was voluntary and the participants had the option to opt out if discomfort would have arisen. Before the start of the experiment the ethics committee granted approval.

Instrumentation

Instructional video. Two instructional videos were produced. One pencast video, that showed the learning content step-by-step with a voice-over narration by the instructor. The other video was the same pencast video, but it included a shoulder-up view of the instructor in the right bottom corner. All factors were constant besides the visibility of the instructor (see figures 1 and 2 as a comparison of the same segment).
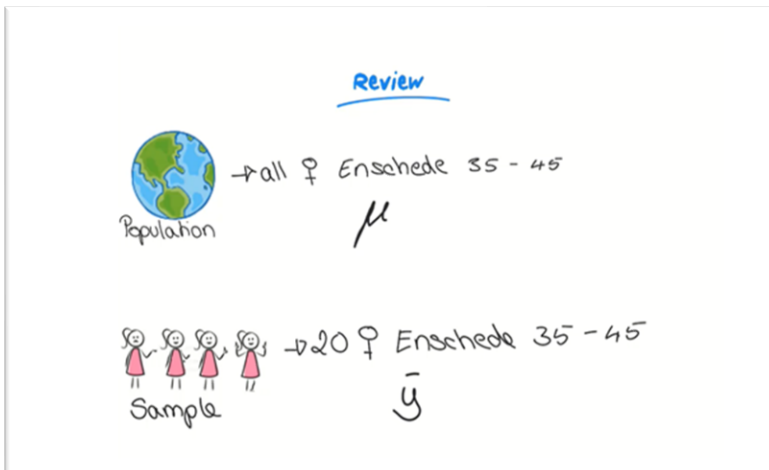
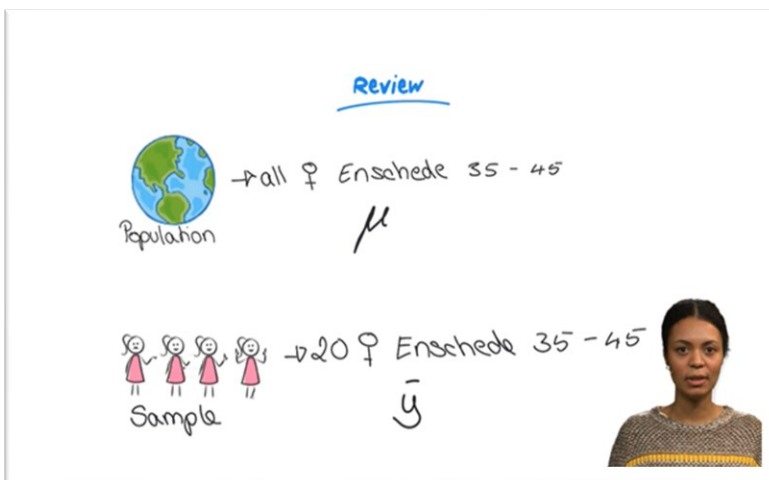*Figure 1. Pencast, instructional video without the instructor being visible.*

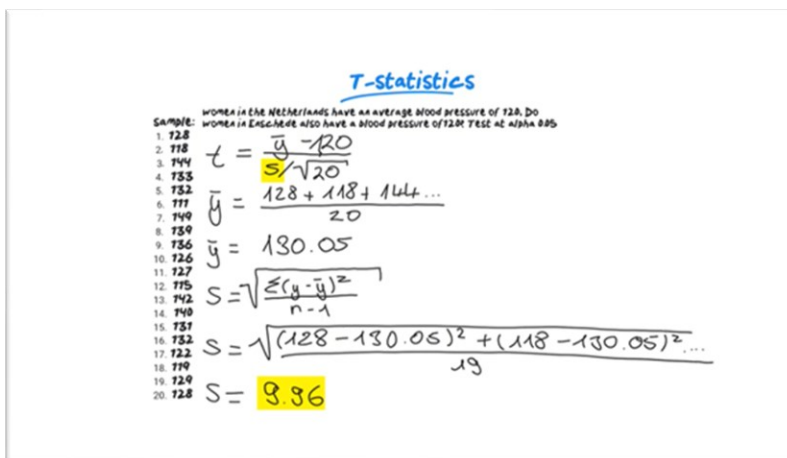*Figure 2. Pencast, instructional video with the instructor being visible.*

Figure 3. Pencast, instructional video without the instructor being visible.

The content of the instructional video has been developed in cooperation with the teacher of the statistics course. It showed how to calculate a one sample t-test by hand. Both videos had a total length of 11 minutes and were segmented into five parts.

The first segment was 1:12 minutes long including the opening. It started with a review in which the students were familiarized with the important concepts (e.g., sample, population, mean), as shown in figure 1. These concepts were not new to the students. They either were introduced to the concepts in a previous pre-master course or in a previous study program (e.g., bachelor). The aim of the review was to activate prior knowledge on which the following information can be built on.

The second segment was 3:66 minutes long and introduced a problem and its context. The research question posed in the video was "Women in the Netherlands between the age of 35 and 45 have an average blood pressure of 120. Do women in Enschede also have a blood pressure of 120?" After the introduction of the research question, possible hypotheses were introduced and explained. Then the associated hypothesis was highlighted, to draw attention to the suitable hypothesis. The video then had a 3 second pause before moving to the next segment.

The third segment was 2:76 minutes long. It showed how to calculate the t-score, namely introducing the formula and filling it in with the correct numbers, followed by a step-by-step calculation to determine the t-score. The segment started by showing the previously introduced problem in a handwritten style on top of the screen. The sample was shown on the left side so that all needed information was visible (see Figure 2). The formula was introduced, filled in with the numbers from the problem statement (e.g., μ) and the sample, then it was calculated. Highlighting was used to help the student associate calculated numbers

to the symbols within the formula. This was intended to draw attention to the step-by-step process of calculating. The video then had another 3 second pause before it proceeded.

The fourth segment was 2:68 minutes long. It showed how to compare the calculated t-score with the critical value. It showed how to find the critical value in the table and what conclusion to take depending on the values. The video ended with an overall summary of 1:35 minutes to highlight all necessary steps to calculate a T-test by hand.

Website/User log. The website "Graasp" (https://graasp.eu/) was used to display the videos. Each student used a personal log-in name to access the appropriate video. The students could start, pause and rewind the video by themselves using the toolbar under the video.

State Anxiety questionnaire. A questionnaire, consisting of eight items was used to measure anxiety towards statistics. The questionnaire was adapted from the statistics anxiety rating scale (STAR) developed by Cruise et al. (1985). This rating scale is widely used and consists of 51 items in total, which cover six subscales namely, worth of statistics, interpretation anxiety, test, and class anxiety, computational self-concept, fear of asking for help and fear of statistics teachers (Hanna, Shevlin and Dempster, 2008). However, as responding to too many items might drain the attention of the participants only eight items were used in this study. The items were chosen by the researcher based on suitability for the study and included three items from the subscale test and class anxiety, two items from the subscale interpretation anxiety and one item from the subscale computational self-concept additionally one item was added by the researcher.

Some of the chosen items were changed to make them more suitable for the study. For example, one item was adapted to match the vocabulary used at the University of Twente

furthermore, another item was divided into two separate items to make the items more specific. An additional item was added by the researcher to cover physical presence within the tutorial as tutorials are part of the statistics course at the university. Furthermore, it was tried to create a coherent sentence structure throughout the questionnaire (see appendix 2 and 3). An example item is "I feel anxious when doing the assignments for the statistic course". The items were answered by the participants on a 7-point Likert scale (1-strongly disagree to 7 -strongly agree). The reliability for the scales found Cronbach's alpha at .91 for the pre-test scale and .91 for the post-test scale.

Social presence questionnaire. A questionnaire, consisting of ten items was used to measure perceived social presence. The questionnaire was adapted from Li, Kizilcec, Bailenson and Ju (2016) and three additional items created by the researcher, were added to make the questionnaire suitable for the context (see appendix 4 and 5). The changes of the items included modifications in the vocabulary to make the items less abstract. Furthermore, items were added to incorporate the viewers' perception of the voice and speaking pattern of the instructor and if the participants could form a distinct impression of the instructor through the medium (see appendices 4 and 5). An example item is "I felt accompanied by the instructor". The participants answered the questionnaire on a 7-point Likert scale (1-strongly disagree to 7-strongly agree). The reliability analysis found Cronbach's alpha at .86 for the used scale.

Performance test. A performance test was conducted to measure the students´ statistical performance level. The performance test consisted of two open questions; each question had four sub-questions. The participants were asked to perform a one sample t-test by hand as shown in the instructional video. The first question was a retention test, meaning the question was in its context similar to the example they had viewed in the instructional

video. The second question was a transfer test, meaning the context was different from what the students had seen in the video. The questions were developed with the teacher of the course inferential statistics.

Procedure

The experiment was conducted during the scheduled statistics tutorial and extended proximally 15 to 20 minutes into the break. In total the experiment took 45 to 55 minutes for the students to complete. There were two sessions of data collection, one session was in the morning, the other in the afternoon on the same day.

At the beginning of the experiment, an instructional booklet was handed out to the students, containing the consent form, a description of the study, the questionnaires, and instructions to complete the experiment. The participants were asked to fill out the anxiety questionnaire at first, then they proceeded to watch the video. The students watched the video on their own devices using headphones. Students had the option to pause or rewind the video while watching it. Once they had completed watching the video, they were instructed to log out of the learning environment where the video was available.

Afterward, the students filled in the questionnaire for anxiety and perceived social presence. Furthermore, they answered two open questions, that were testing conceptual and procedural knowledge. The participants had approximately 45 to 55 min to complete the whole experiment (including watching the video, filling out the questionnaires and calculating the open questions).

Data analysis

This section will describe how the collected data was analyzed. First, reliability for the used scales was tested using Cronbach's alpha. Furthermore, the average mean scores

were calculated for the dependent variables and normality was tested using the Shapiro Wilk test.

Social presence. To analyze perceived social presence further the Shapiro Wilk test was conducted and showed that the data was normally distributed, thus a one-tailed independent sample t-test was chosen to determine whether the condition including the instructor in the instructional video scored higher on perceived social presence than the condition excluding the instructor from the video.

State anxiety. The Shapiro Wilk test showed that the data was normally distributed, therefore a one-tailed independent sample t-test was chosen to determine whether there was a significant decrease in state anxiety between the two conditions. Furthermore, a paired-sample t-test was conducted to determine whether there was a decrease in state anxiety level between pre and post-test measure not taking the conditions into account. Furthermore, correlation analysis was conducted to determine whether there was relationship between perceived social presence and state anxiety. Visual examination revealed that assumptions for linearity were violated therefore, the Spearman Rank correlation was chosen.

Performance. A code book was developed to assign points to the students' responses. The two questions had four sub-questions. For each sub-question two points could be earned, thus a maximum of eight points per question was possible to earn (a maximum of 16 points was possible for the entire performance test). 1 point was given if the question was explicitly and fully answered, 0,5 point was given if the question was answered partially, and 0 points were given if the question was not answered or answered incorrect (see appendix 7). The total scores for performance were calculated for each participant. The Shapiro Wilk test showed that the data was not normally distributed, thus a non-parametric test was chosen (Mann-

Whitney U-test) to determine whether there was a difference in the effect of condition between the two groups.

Results

This section comprises the analysis of the results. The data will be presented starting with the descriptive statistics for the studied variable, followed by the data regarding the differences in perceived social presence, state anxiety and performance.

Descriptive statistics for the participants' perceived social presence, state anxiety and performance are presented below (table 1). Social presence and performance were measured after the participants have watched the instructional videos, while state anxiety was measured before and after. The table below displays the mean and standard deviation of the studied variables for both conditions.

Table 1. Descriptive statistics

Variables	Mean *(Standard Deviation)*		
	condition including the instructor (n = 31)	Condition excluding the instructor (n = 35)	Total (n = 66)
Perceived social presence	5.13 *(0.84)*	4.80 *(0.69)*	4.95 *(0.78)*
State anxiety before	3.39 *(1.12)*	3.76 *(1.26)*	3.58 *(1.20)*
State anxiety after	3.15 *(0.98)*	3.66 *(1.23)*	4.42 *(1.14)*
Performance	12.37 *(3.28)*	12.89 *(3.18)*	12.64 *(3.21)*

To analyze differences in perceived social presence a one-tailed independent samples t-test was conducted, more specifically it was determined whether the viewers of the pencast video including the instructor (instructor present) scored higher on social presence compared to the viewers of the pencast video excluding the instructor (instructor absent). The results

were significant, with t (64) = 1.73, *p* = .045. This showed that on average, viewers of the pencast video including the instructor (*M* = 5.13; *SD* = .84) did score higher on social presence than the viewers of the pencast video excluding the instructor (*M* = 4.80; *SD* = .69).

To analyze differences in state anxiety a one-tailed independent samples t-test was conducted, more specifically it was determined whether the viewers of the pencast video including the instructor (instructor present) scored lower on state anxiety compared to the viewers of the pencast video excluding the instructor (instructor absent). The results were significant, with t (64) = -1.87, *p* = .034. This showed that on average, viewers of the pencast video including the instructor (*M* = 3.15; *SD* = .98) did score lower on state anxiety than the viewers of the pencast video excluding the instructor (*M* = 3.66; *SD* = 1.23).

Furthermore, a paired sample t-test was conducted to analyze whether state anxiety levels among the students could be reduced through viewing the videos, not taken the condition into account. The results were significant, with t (65) = 2.06, *p* = .044. This showed that on average, participants' anxiety level toward statistic reduced from the pre-test questionnaire (*M* = 3.58; *SD* = 1.20) to the post-test questionnaire (*M* = 3.42; *SD* = 1.14).

A correlation analysis was used to determine the relationship between perceived social presence and state anxiety. Spearman correlation revealed that there was a non-significant weak correlation between perceived social presence and state anxiety in the conditions including the instructor r_s (29) = .124; p = .51, as well as in the condition excluding the instructor r_s (33) = -.143; p = .41

To analyze difference between performance a Mann Whiney U-test was conducted. The results of the test indicated that the difference of performance between the viewers of the pencast video including the instructor (*Mdn* = 13) compared to the viewers of the pencast

video excluding the instructor (*Mdn* = 14) was not significant *U* ($N_{present}$ = 31; N_{absent} = 35) = 498.50, *z* = -.571, *p* = .568.

Discussion

The aim of the current study was to investigate if the visibility of the instructor in an instructional video for statistics had an impact on student's perceived social presence, state anxiety and performance. Furthermore, it was investigated whether a correlation existed between perceived social presence and state anxiety. Previous research has investigated the impact of the instructor's visibility on social presence and student's performance, but after reviewing existing studies it appears that research about the influence of the instructor's visibility on student's anxiety is lacking.

The first research question was "What is the effect of the instructors' visibility in an instructional statistics video on students' perceived social presence?" To answer this question the post-test responses between the groups were compared. The results showed that participants viewing the instructional video including the instructor scored on average higher in perceived social presence. This result was significant, and it is in line with the hypothesis that instructor visibility will lead to higher perceived social presence. The hypothesis assumes that the psychological distance between communicators can be influenced by verbal and non-verbal social cues, which leads to higher social presence (Gunawardena and Zittel, 1997). In this case the visibility of the instructor might have given the opportunity to transmit social cues, which only could be transmitted through the visibility of the instructor, such as eye contact or smiling, this could be the reason for higher perceived social presence. Furthermore, the social agency theory suggests that the use of social cues in multimedia learning can be used to foster the impression that the learner interacts with a real human (Atkinson, Mayer &

Merrill, 2005). From this perspective, the visibility of the instructor and the display of the facial expression might enhance the feeling of human-like interaction and evokes a stronger social response.

The second research question was "What is the effect of the instructors' visibility in an instructional statistics video on student's state anxiety?" It was hypothesized that the instructor's visibility will lead to decreased levels of state anxiety among students. To answer this research question the post-test results between the groups were compared. The results showed that on average state anxiety was decreased significantly in the groups viewing the instructional video including the instructor compared to the group excluding the instructor. These results are in line with the hypothesis that the instructional video including instructor will lead to lower levels of anxiety among students compared to the instructional video excluding instructor. This is also in line with previous research indicating that teacher´s immediacy, namely verbal and non-verbal social cues can decrease student anxiety (Williams, 2010; Tonsing, 2018). Reason for the working mechanism behind the findings are not clear and demand further investigation. However, Williams (2010) indicated that social cues may function as safety signals and therefore help students in reducing their anxiety. Furthermore, it was investigated if viewing the instructional videos regardless of the condition, will lead to decreased state anxiety. Pre-test and post-test score for state anxiety were compared and indicated a significant decrease of state anxiety between pre and post-test results. Literature suggests that a feeling of control over a threatening situation plays an important role in reducing anxiety (Bandura, 1988; Carden, Bryant & Moss, 2004). In this case it is possible that the illustrated example shown in the instructional videos, as well as the function to stop, pause and replay the videos, helped the viewers to perceive that they had more control over statistical tasks/assignments than previously expected.

The third research question was "What is the relationship between perceived social presence and state anxiety". To answer this question a correlation analysis was conducted. The result showed no significant correlation between perceived social presence and state anxiety. Previous research has linked verbal and non-verbal communication cues of the teacher to reduced anxiety (Chesebro, 2003, Williams, 2010). In this study the construct of social presence assumes that social cues can increase perceived social presence. Social cues also have been identified as anxiety reducing, therefore it was hypothesized that increased social presence might lead to decreased anxiety. However, the construct of social presence is not limited to social cues, it is a broader construct which also captures the impression the viewers have on the instructor as "real being". This might be the reason why no direct relationship was found.

The fourth research question was "What is the effect of the instructors' visibility in an instructional statistics video on students' performance?" To answer this question the post-test responses between the groups were compared. The results showed no significant difference in students' performance level. These results are not in line with the hypothesis that students viewing the instructional video will perform better than those viewing the video without the instructor present. Previous research suggests that learners receiving direct eye contact paid more attention on the instructors' face while learners receiving guided glaze focused more on the learning content and therefore performed better (Pi et al., 2020). In the present study the incorporation of the instructor and the displayed social cues did not guide the viewers' attention, thus the displayed social cues might not be the most suitable to enhance learning. This could be addressed in a follow up study by incorporating social cues specifically chosen to enhance learning through guiding viewer's attention. Furthermore, eye-tracking technology could be used to interpret the function of the instructor's visibility better. Additionally, information on student's usage of instructional videos to learn new or difficult

content could be asked to investigate whether the students are familiar with instructional videos as learning medium.

Several limitations in this study needs to be acknowledged. Generalizability of the present findings is limited because of weaknesses in the study design, namely the set up of the experiment, duration of the experiment and the population. The experiment was situated in a classroom of the university and started during an official statistic tutorial. The participants remained seated on their original spots and used their own devices to watch the video. Fewer participants at a time as well as a change of location may would have created a more controlled environment. The duration of the experiment was limited to one point in time. The study by Ilioudi, Chorianopoulos and Giannakos (2013) compared instructional videos with and without the instructor present in mathematics class and measured performance at three points in time. They found that over time, students viewing the video with the instructor performed better. Thus, time might be an important aspect to consider. Participants may need more time to get familiar with the instructional videos. Moreover, the participants within the experiment were all pre-master students from the same faculty of the same university, thus a very specific population was involved in this study.

For future research, it would be interesting to investigate the inclusion of the instructor and his/her influence on perceived social presence and anxiety in other educational settings and with other populations. Furthermore, the experiment could be conducted over a longer period. Ilioudi, Chorianopoulos and Giannakos (2013) point out that students might need some time to get familiar with a new learning format. Thus, several learning sessions with and instructional video might yield different results. Further research can investigate which features specifically lead to decreased anxiety and the working mechanism behind them. For this, additional conditions could be included which show the instructor displaying different social cues.

In the present study the influence of the instructor's visibility in an educational statistic video at a university level was explored. The results point to implications for practice by providing insights on design features of instructional videos. Practitioners should be aware that the incorporation of the instructor's view can be utilized to reduce student's anxiety toward statistics in an educational video. Furthermore, did the incorporation of the instructor lead to higher social presence which can lead to positive effects as shown by Guo, Kim and Rubin (2014) and Kizilcec, Papadopoulos and Sritanyaratana (2014). Although, this study did not find an effect of instructor visibility on performance, previous studies have shown that specific social cues (e.g., guided gaze) displayed by the instructor can lead to better performance. Reasons for that could be that social cues such as guided gaze can support learners by determining when to focus on the learning content and when to focus on the instructor (Pi et al., 2020). This indicates that small nuances in non-verbal cues can yield different results. Moreover, this study might be informative for future research focusing on design features in instructional videos to decrease anxiety levels of viewers.

References

Argyle, M., & Dean, J. (1965). Eye contact and distance affiliation. Sociometry, 28(3), 289-304.

Atkinson, R., Mayer, R., & Merrill, M. (2005). Fostering social agency in multimedia learning: Examining the impact of an animated agent's voice. *Contemporary Educational Psychology*, *30*(1), 117-139. doi: 10.1016/j.cedpsych.2004.07.001

Baker, C. (2010). The Impact of Instructor Immediacy and Presence for Online Student Affective Learning, Cognition, and Motivation. *The Journal Of Educators Online*, *7*(1). https://doi.org/10.9743/jeo.2010.1.2

Bandura, A. (1988). Self-efficacy conception of anxiety. *Anxiety Research*, 1(2), pp.77-98.

Beege, M., Schneider, S., Nebel, S., & Rey, G. D. (2017). Look into myeyes! Exploring the effect of addressing in educational videos. *Learning and Instruction, 49,* 113–120. http://dx.doi.org/10.1016/j.learninstruc.2017.01.004

Blalock, H.M. (1987). Some general goals in teaching statistics. *Teaching Sociology,*15, 164-172.

Carden, R., Bryant, C., & Moss, R. (2004). Locus of Control, Test Anxiety, Academic Procrastination, and Achievement among College Students. *Psychological Reports*, *95*(2), 581-582. doi: 10.2466/pr0.95.2.581-582

Cattell, R. B. (1966). Patterns of change: Measurement in relation to state-dimension, trait change, lability, and process concepts.Handbook ofMultivariate Experimental Psychology. Chicago: Rand McNally.

Chesebro, J. L. (2003). Effects of teacher clarity and nonverbal immediacy on student

    learning, receiver apprehension, and affect. Communication Education, 52, 135–147.

    doi:10.1080/ 03634520302471

Chesebro, J. L., & McCroskey, J. C. (2001). The relationship of teacher clarity and

    immediacy with student state receiver apprehension, affect, and cognitive learning.

    Communication Education,50, 59–68. doi:10.1080/03634520109379232

Chew, P. K. H., & Dillon, D. B. (2014). Statistics anxiety update: Refining the construct and

    recommendations for a new research agenda. *Perspectives on Psychological Science,*

    9(2), 196–208. https://doi.org/10.1177/1745691613518077.

Cobb, S. C., (2009).Social Presence and Online Learning: A Current View from a Research

    Perspective. *Journal of Interactive Online Learning, 8(3)*

Cruise, J. R., Cash, R. W., and Bolton, L. D. (1985), "Development and Validation of an

    Instrument to Measure Statistical Anxiety," in American Statistical Association

    Proceedings of the Section on Statistical Education, pp. 92-98.

DeVaney, T. (2010). Anxiety and Attitude of Graduate Students in On-Campus vs. Online

    Statistics Courses. *Journal of Statistics Education*, 18(1).

Dillon, K.M. (1982). Statisticophobia. *Teaching of Psychology*, 9, 117.

Endler, N. and Kocovski, N., 2001. State and trait anxiety revisited. Journal of Anxiety

    Disorders, 15(3), pp.231-245.

Eysenck, M. (1979). Anxiety, learning, and memory: A reconceptualization. *Journal Of*

    Research In Personality, *13*(4), 363-385. doi: 10.1016/0092-6566(79)90001-1

Eysenck, M., Derakshan, N., Santos, R., & Calvo, M. (2007). Anxiety and cognitive

performance: Attentional control theory. *Emotion*, *7*(2), 336-353. doi: 10.1037/1528-

3542.7.2.336

Fiorella, L., & Mayer, R. E. (2016). Effects of observing the instructor drawdiagrams on

learning from multimedia messages. *Journal of Educational Psychology, 108,* 528–

546. http://dx.doi.org/10.1037/edu0000065

Fiorella, L., Van Gog, T., Hoogerheide, V., & Mayer, R. E. (2017). It's all a matter of

perspective: Viewing first-person video-modeling examples promotes learning of an

assembly task. *Journal of Educational Psychology, 109,* 653–665.

http://dx.doi.org/10.1037/edu0000161

Frankenhaewer, M. (1975). Experimental approaches to the study of catecholamines and

emotion. In L. Levi (Ed.), Emotions: Their parameters and measurement (pp. 209-

234). New York Raven.

Frymier, A. (1994). A model of immediacy in the classroom. Communication Quarterly, 42,

133/144.

Garrison, D. (2007). Online Community of Inquiry Review: Social, Cognitive, and Teaching

Presence ISSUES. *Journal Of Asynchronous Learning And Networks*, *11*(1), 61-72.

https://doi.org/10.24059/olj.v11i1.1737

Grice , H. P. (1975). Logic and conversation. In P. Cole & J. Morgan (Eds.), *Syntax and

semantics* (vol. 3, pp. 41–58). New York : Academic Press .

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and

collaborative learning in computer conferences. *International Journal of Educational

Telecommunications, 1(2/3), 147-166.*

Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction with a computer-mediated conferencing environment. *American Journal of Distance Education, 11*, pp.8-26.

Guo, P., Kim, J., & Rubin, R. (2014). How video production affects student engagement. *Proceedings Of The First ACM Conference On Learning @ Scale Conference*. doi: 10.1145/2556325.2566239

Hanna, D., Shevlin, M. and Dempster, M., 2008. The structure of the statistics anxiety rating scale: A confirmatory factor analysis using UK psychology students. *Personality and Individual Differences*, 45(1), pp.68-74.

Ilioudi, C., Chorianopoulos, K. and Giannakos, M. (2016). Comparing the camera shot styles of video lectures: Close-up versus broad framing of whiteboard and lecturer. *Διεθνές Συνέδριο για την Ανοικτή & εξ Αποστάσεως Εκπαίδευση*, 7(6B).

Kelly, S., Rice, C., Wyatt, B., Ducking, J. and Denton, Z., 2015. *Teacher Immediacy and Decreased Student Quantitative Reasoning Anxiety: The Mediating Effect of Perception*. Communication in Education, 64 (2), p. 171-186 DOI:10.1080/03634523.2015.1014383

Kizilcec, R. F., Bailenson, J. N., & Gomez, C. J. (2015). The instructor's face in video instruction: Evidence from two large-scale field studies. *Journal of Educational Psychology, 107*, 724 –739. http://dx.doi.org/10.1037/edu0000013

Kramer, N. C., & Bente, G. (2010). Personalized e-learning: The social effects of pedagogical agents. *Educational Psychology Review*, *22*, 71–87.

Levi, L. (Ed.) (1972). Stress and distress in response to psychosocial stimuli. Acta Medica Scandinavica, 191, Supplement No. 528.

Li, J., Kizilcec, R., Bailenson, J., & Ju, W. (2016). Social robots and virtual agents as

    lecturers for video instruction. *Computers In Human Behavior*, *55*, 1222-1230. doi:

    10.1016/j.chb.2015.04.005

Lusk, M. M., & Atkinson, R. K. (2007). Animated pedagogical agents: Does their degree of

    embodiment impact learning from static or animated worked examples? *Applied*

    Cognitive Psychology, *21*, 747–764.

Mahmood, N., & Rana, R. (2010). The Relationship between Test Anxiety and Academic

    Achievement. *Bulletin Of Education And Research*, *32*(2), 63-74.

Marteau, T., & Bekker, H. (1992). The development of a six-item short-form of the state

    scale of the Spielberger State—Trait Anxiety Inventory (STAI). *British Journal Of*

    Clinical Psychology, *31*(3), 301-306. doi: 10.1111/j.2044-8260.1992.tb00997.x

Mayer, R. E. (2014). Principles Based on Social Cues in Multimedia Learning:

    Personalization, Voice, Image, and Embodiment Principles. The Cambridge

    Handbook of Multimedia Learning, 345–368. doi:10.1017/cbo9781139547369.017

Mayer, R. E., & DaPra, C. S. (2012). An embodiment effect in computer-based learning with

    animated pedagogical agents. Journal of Experimental Psychology Applied, 18(3),

    239e252.

Mayer, R. E., Dow, G. T., & Mayer, S. (2003). Multimedia learning in an interactive self-

    explaining environment: What works in the design of agent-based microworlds?

    Journal of Educational Psychology, 95(4), 806e812.

McLaren , B. M. , DeLeeuw , K. E. , & Mayer , R. E. (2011b). A politeness effect in

Moreno, R., & Mayer, R. E. (2000). Engaging students in active learning: The case for

    personalized multimedia messages. *Journal of Educational Psychology*, *92*, 724–733.

Onwuegbuzie, A. (2004). Academic procrastination and statistics anxiety. *Assessment & Evaluation in Higher Education*, 29(1), pp.3-19.

Onwuegbuzie, A. J., and Wilson, V. A. (2003), "Statistics Anxiety: Nature, Etiology, Antecedents, Effects, and Treatments-A Comprehensive Review of Literature," Teaching in Higher Education, 8, 195-209.

Onwuegbuzie, A. J., DaRos, D. & Ryan, J. (1997) The components of statistics anxiety: a phenomenological study, Focus on Learning Problems in Mathematics, 19(4), 11–35.

Patkai, P. (1971). Catecholamine excretion in pleasant and unpleasant situations. Acta Psychologica, 35, 352 -363

Pi, Z., Xu, K., Liu, C., & Yang, J. (2020). Instructor presence in video lectures: Eye gaze matters, but not body orientation. *Computers & Education*, *144*, 103713. https://doi.org/10.1016/j.compedu.2019.103713

Mahmood, N., & Rana, R. (2010). The Relationship between Test Anxiety and Academic Achievement. *Bulletin Of Education And Research*, *32*(2), 63-74.

Schachter, S., & Singer, J. (1962). Cognitive, social, and physiological determinants of emotional state. *Psychological Review, 69*(5), 379–399. https://doi.org/10.1037/h0046234

Short, J., Williams, E., & Christie, B. (1976). The social psychology of telecommunications. London: John Wiley & Sons.

Sridevi, K. (2013). A Study of Relationship among General Anxiety, Test Anxiety and Academic Achievement of Higher Secondary Students. *Journal Of Education And Practice*, *4*(1).

Steinmayr, R., Crede, J., McElvany, N., & Wirthwein, L. (2016). Subjective Well-Being,
Test Anxiety, Academic Achievement: Testing for Reciprocal Effects. *Frontiers In
Psychology*, *6*. doi: 10.3389/fpsyg.2015.01994

Swan, K., & Shih, L. (2019). ON THE NATURE AND DEVELOPMENT OF SOCIAL
PRESENCE IN ONLINE COURSE DISCUSSIONS. *Online Learning*, *9*(3). doi:
10.24059/oljv9i3.1788

Sweller, J., van Merrienboer, J.J.G. & Paas, F.G.W.C. Cognitive Architecture and
Instructional Design. *Educational Psychology Review* **10,** 251–296 (1998).
https://doi.org/10.1023/A:1022193728205

Tonsing, K., 2017. Instructor immediacy and statistics anxiety in social work undergraduate
students. *Social Work Education*, 37(2), pp.223-233.
doi.org/10.1080/02615479.2017.1395009

Tu, C. (2000). On-line learning migration: from social learning theory to social presence
theory in a CMC environment. *Journal of Network and Computer Applications*, 23(1),
pp.27-37.

Tu, C. H., & McIsaac, M. (2002). The relationship of social presence and interaction in
online classes. *The American Journal of Distance Education, 16*(3), 131-150

van der Meij, H. and Dunkel, P. (2019). Effects of a review video and practice in video-based
statistics training. *Computers & Education*, 143, p.103665.

Wang, J., & Antonenko, P. (2017). Instructor presence in instructional video: Effects on
visual attention, recall, and perceived learning. *Computers In Human Behavior*, *71*,
79-89. doi: 10.1016/j.chb.2017.01.049

Wiener, M., & Mehrabian, A. (1968). Language within language: Immediacy, a channel in

    verbal communication. New York: Appleton-Century-Crofts.

Williams, A. (2010). Statistics Anxiety and Instructor Immediacy. *Journal of Statistics*

    Education, 18(2).

Zeidner, M. (1990). Does Test Anxiety Bias Scholastic Aptitude Test Performance by Gender

    and Sociocultural Group?. *Journal of Personality Assessment*, 55(1-2), pp.145-160.

Appendices

Appendix 1: Informed consent form

Thank you for agreeing to participate in this research experiment. During the experiment I would require your complete, undistracted attention. So, I ask that you follow these instructions carefully. Please do not open other applications on your computer or engage in other distracting activities (e.g. using phone). Please focus on your own screen and tasks and not others.

You are asked to follow all instructions of this booklet. The instructor will be in the room throughout the entire session but can only be consulted if you feel discomfort and wish to withdraw from the experiment. All information will be handled confidentially by the researcher.

Please fill out the following:

Name:

Age:

Gender:

Informed Consent Form

The influence of the instructor's presence on Student achievement and self-efficacy

By Anna Kangni

Purpose of the research

This research is part of my MAs thesis. The aim of the research is to evaluate the presence of the instructor for educational videos. For this research, participants watch an educational video about statistics and complete a small task afterwards.

Procedures

You will participate in an experiment, lasting approximately 45 min. You will be asked to fill in some questions about your self-efficacy and anxiety. Then you will be instructed to watch a video, which lasts approximately 10 min. Afterwards, you are asked to perform a task, similar to what was shown to you in the video. Furthermore, you are asked to fill out a questionnaire about self-efficacy, anxiety and your perception of the instructor.

Potential risks

The research has been reviewed and approved by the Ethics Committee. There are no known risks caused by participating in this study. You do not have to answer any questions which make you feel uncomfortable.

Potential Benefits

There are some possible benefits involved in participating in the study. You review statistical content which is subject of the first statistics exam of the course Inferential Statistics. The study may help you to prepare for this exam and gives you the opportunity to practice. Furthermore, you can experience the setup of an experiment/research, which may be beneficial for you, once you do your own.

Confidentiality

Your privacy will be protected according to the law. Only the involved research staff will have access to your responses (the researcher and the supervisor). Your personally identifiable information will not be reported in the paper. Within these restrictions, results of this study will be made available to you upon request.

Right to Withdraw

Participation in this study is voluntary. If you choose to take part in the study, you may stop participating at any time. You do not need to give any justification if you choose to withdraw. If you decide not to participate in the study or withdraw from the study, you will not be penalized or lose any benefits. If you have any questions, concerns or complaints about the research, please contact the primary researcher: Anna Kangni, a.a.kangni@student.utwente.nl, MSc student Educational Science and Technology.

Statement of Consent

Your signature indicates that you have read and understood the information on this consent form, your questions have been answered to your satisfaction and you voluntarily agree that you will participate in this research study.

1. I agree to participate in the research experiment led by Anna Kangni. The purpose of this document is to specify the terms of my participation in the experiment.

2. I have been given sufficient information about this research project. The purpose of my participation as a participant in this project has been explained to me and is clear.

3. I consent voluntarily to be a participant in this study and understand can withdraw from the study at any time, without giving a reason.

4. I understand that taking part in the study involves watching videos. The experiment will approximately last 45 min. I allow the researcher to use my data for her study.

5. I have been given the guarantee that this research project has been reviewed and approved by the BMS Ethics Committee. For research problems or any other question

regarding the research project, the Secretary of the Ethics Commission of the faculty Behavioral, Management and Social Sciences at University Twente may be contacted through ethicscommittee-bms@utwente.nl

6.   I have read and understood the points and statements of this form. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

_____   _____   _____

Participant name [printed]   Signature   Date

_____   _____   _____

Researcher name [printed]   Signature   Date

Appendix 2: Modified anxiety questionnaire

The original and revised items from the STAR questionnaire

No.	Version	Item
1	Original	Doing the course work for a statistic course
	Revised	Doing the assignments for a statistics course
2	Original	Doing an examination in a statistics course
	Revised	Doing an examination in a statistics course
3	Original	Determining whether to reject or retain the null hypothesis
	Revised	Determining whether to reject or retain the null hypothesis
4	Original	Finding that another student in class got a different answer than I did to a statistical problem
	Revised	Finding that another student in class got a different answer than I did to a statistical problem
5	Original	Since I have never enjoyed maths I do not see how I can enjoy statistics
	Revised	Doing the calculations and other mathematical aspects in statistics
6	Added by researcher	Going to the statistics lectures/tutorials
7	Original	Interpreting the meaning of a probability value once I found it
	Revised	Drawing a conclusion based on the calculated values
	Revised	Using the T-table to find the critical value/p-value

Note: Revised questions were asked as "I feel anxious when (item X)"

Appendix 3: Used anxiety questionnaire.

I feel anxious/stressed when:	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	Agree	Strongly Agree
Doing the assignments for a statistics course	1	2	3	4	5	6	7
Doing an examination in a statistics course	1	2	3	4	5	6	7
Finding that another student in class got a different answer than I did to a statistical problem	1	2	3	4	5	6	7
Determining whether to reject or retain the null hypothesis	1	2	3	4	5	6	7
Doing the calculations and other mathematical aspects in statistics	1	2	3	4	5	6	7
Going to the statistics lectures/tutorials	1	2	3	4	5	6	7
Drawing a conclusion based on the calculated values	1	2	3	4	5	6	7
Using the T-table to find the critical value/p-value	1	2	3	4	5	6	7

Appendix 4: Modified social presence questionnaire.

The original and revised items from the social presence scale

No.	Version	Item
1	Original	I felt accompanied by an intelligent being
	Revised	I felt accompanied by the instructor
2	Original	I paid attention to the instructor
	Revised	I paid attention to the instructor
3	Original	I felt involved with the instructor
	Revised	I felt involved with the instructor
4	Added by the researcher	The instructor refers to activities as, what "we" are doing.
5	Added by the researcher	The instructor uses a friendly/engaged voice while talking
6	Original	I like the instructor
	Revised	I like the instructor
7	Original	I think the instructor could be a friend of mine
	Revised	I think the instructor could be a friend of mine
8	Original	I think I could work with the instructor
	Revised	I think I could work with the instructor
9	Original	I felt as if I were interacting with an intelligent being
	Revised	The instructor gave me the feeling of real life interaction
10	Added by the researcher	I was able to form a distinct impression of the instructor

Note: the items were answered on a Likert scale 1 to 7 (strongly disagree to strongly agree)

Appendix 5: Used social presence questionnaire.

	Strongly disagree	Disagree	Slightly disagree	Neutral	Slightly agree	agree	Strongly agree
I felt accompanied by the instructor	1	2	3	4	5	6	7
I paid attention to the instructor	1	2	3	4	5	6	7
I felt involved with the instructor	1	2	3	4	5	6	7
The instructor refers to activities as, what "we" are doing.	1	2	3	4	5	6	7
The instructor uses a friendly/engaged voice while talking	1	2	3	4	5	6	7
I like the instructor	1	2	3	4	5	6	7
I think the instructor could be a friend of mine	1	2	3	4	5	6	7
I think I could work with the instructor	1	2	3	4	5	6	7
The instructor gave me the feeling of real live interaction	1	2	3	4	5	6	7
I was able to form a distinct impression of the instructor	1	2	3	4	5	6	7

Question 1

In the Netherlands the average Body Mass Index (BMI) for men between the age of 25 and 40 lies at 25,5. The result is considered healthy. You do a research in a neighborhood which is considered disadvantaged from a socio-economic perspective. You want to know if men in that age group differ in their BMI from the average in the Netherlands. To find out you did a measurement. You randomly selected 10 men between the age of 25 and 40 from that neighborhood. You will test with an alpha of 0.05. Sample: 29, 30, 27, 26, 24, 24, 32, 27, 31, 25

a)   Formulate H0 and HA

b)   Determine the sample mean and the standard deviation

c)   Calculate the test statistic (t-score) and determine the degrees of freedom

d)   Draw a clear conclusion

Question 2

You are a student working on your master thesis. Your research is about IQ level of students from different universities. The average IQ of people lies at 100, you want to know if the IQ of Harvard students is higher than that. You randomly selected 10 people to do and IQ test to find out. These are the results: 115, 125, 125, 110,113,105,112,130,118, 120
Test with an alpha of 0.05!

a)   Formulate H0 and HA

b)   Determine the sample mean and the standard deviation

c)   Calculate the test statistic (t-score) and determine the degrees of freedom

d)   Draw a clear conclusion

The performance test consisted of two open questions (see appendix 6). Both questions consisted of four sub-questions (see below). Each of these sub-questions has two components for which 1 full point was given if answered correctly. Thus, a maximum of eight full points were possible if all answers were complete and correct.

A) Formulate H0 and HA.
B) Determine the sample mean and the standard deviation.
C) Calculate the test statistic (t-score) and determine the degrees of freedom.
D) Draw a conclusion.

Code in SPSS	Description	Minimum score (0)	Partial score (0.5)	Maximum score (1)
A1	Null hypothesis	If answered incorrectly, including wrong number and/or symbol	N/A	If answered fully and correctly
A2	Alternative hypothesis	If answered incorrectly, including wrong number and/or symbol	N/A	If answered fully and correctly
B1	Sample mean	If missing or answered incorrectly	N/A	If answered correctly
B2	Standard deviation	If missing or answered incorrectly	N/A	If answered correctly
C1	Degress of freedom	If missing or answered incorrectly	N/A	If answered
C2	T-statistics	If missing or answered incorrectly	If correct formula used (filled in) but incorrect number calculated	If answered correctly
D1	Digital/mathematical part of the equation (e.g., ==2,20< 2,26== = not sig. thus do not reject H0)	If … - Symbol correct + t* incorrect. - Symbol incorrect + t* incorrect.	If critical value is correct and symbol is incorrect or missing	If … - Symbol correct + t* correct. - Symbol incorrect + t* correct + statement which corrects the error in symbol.
D2	Written part of the equation (e.g., 2,20< 2,26 = ==not sig. thus==	If missing or incorrect conclusion based on beforehand comparison (D1)	If "sig or not sig" is used correctly without	If … - "Sig" or "not sig" is used and a statement about

			further explanation	retaining or dismissing H0 - Statement is made about retaining or dismissing H0
	do not reject H0)			
P-value method (if applicable)			
D1	Digital/mathematical part of the equation (e.g., 0.05< p <0.1 = not sig thus do not reject H0.)	If .. - Numbers are incorrect - Numbers and symbols are incorrect - Symbols are incorrect	N/A	If.. - Numbers and symbols are correct
D2	Written part of the equation (e.g., 0.05< p<0.1 = not sig. thus do not reject H0)	If missing or incorrect in relation to before hand comparison (D1)	If "sig or not sig" is used correctly without further explanation	If… - "Sig" or "not sig" is used correctly in relation to beforehand comparison (D1) and a statement about retaining or dismissing H0 is made - Correct Statement in relation to beforehand comparison, about retaining or dismissing H0 is made

Note: if a number is calculated incorrectly and points are subtracted, no further points are subtracted for this wrong number in follow up calculations.