The Effect of Feminine Clothing Featured in a Video Modeling Example on Learning and Self-efficacy

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Author Note

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Abstract

Video Modeling Examples (VMEs) are gaining popularity within all levels of education, as they are an effective instruction strategy. There is a pressing need for relevant evidence-based guidelines to help teachers and educational policy makers to make informed choices about what makes a VME effective. The current study focuses on the effect of feminine clothing featured in a VME, on learning and self-efficacy. Adolescents (N = 77) were shown three videos in which model neutral or feminine clothes demonstrated how to troubleshoot faulty electrical circuits. Findings show no significant difference between the experimental and control condition, suggesting that feminine clothing does not affect the learning outcome and self-efficacy compared to neutral clothing. These results have to be interpreted with caution, as the sample size (and therefore statistical power) was relatively low. In the further the current study could be replicated with a bigger sample, adult models and longer videos. Based on the current result there is no need for teachers and policy makers prescribe neutral or feminine clothes to models in VMEs.

Key words: Clothing, Video Model Example, Learning, Self-Efficacy

Introduction

The ‘monkey see, monkey do’ principle illustrates the basic mechanism of example-based learning, an effective instruction method for novice learners to acquire new skills (Renkl, 2014; Schunk & Hanson, 1987; Van Gog & Rummel, 2010). It is not possible or safe for humans to rediscover all knowledge by themselves. Therefore, it is more effective to learn from existing knowledge, reorganizing and applying it for one’s own objectives. Unsurprisingly, learning from modeled examples is still prevalent in present day society, since it has proven to be an effective learning strategy for learners, across different age groups and for different subject matters (Van Harsel, Hoogerheide, Verkoeijen, & Van Gog, 2019; Kant, Scheiter, & Oschatz, 2017; Schunk & Hanson, 1985, 1989a, 1989b; Schunk, Hanson, & Cox, 1987;).

Video Modeling Examples (VMEs), videos in which a human model shows how to perform a task, are among the most common example-based instruction delivery strategies in postmodern education (De Koning, Hoogerheide, & Boucheix, 2018). VMEs have become easier, cheaper and more accessible over the last decades, and therefore are used in popular instruction strategies like Massive Open Online Courses and the ‘flip the classroom’ approach (Van der Meij & Van der Meij, 2014). VME’s increased usage has brought forth a pressing need for further development and refining of relevant evidence-based guidelines for improved learning through this instruction delivery strategy (De Koning, et al., 2018; Fiorella & Mayer, 2018). The main objective of a VME is to change skills, attitudes and behaviors. Within the existing literature, studies on the effectiveness of VMEs focused on aspects of video models such as age, sex and level of expertise (Hoogerheide, Wermeskerken, Loyens, & Van Gog, 2016; Hoogerheide, van Wermeskerken, van Nassau & van Gog, 2018). The effect of clothing featured in a VME on Learning and Self-efficacy however has been notably neglected. Given clothes' visual presence throughout VMEs and the fact that previous VMEs effectiveness studies have left methodological features regarding models attire to the researchers' intuition, the effect of model's clothing must be explored. This study focuses on the effect that feminine clothing featured in a VME has on learning and self-efficacy.

Persuasiveness of Expert Models

Related literature suggests that in addition to the message, the source and recipient affect the persuasiveness of a model to change attitudes and behaviors (Nguyen & Masthoff, 2007). Early experiments show how a source of higher expertise (rather than lower expertise) regarding the communicated topic results in greater agreement with the source, even if the arguments are the same (Maddux & Rogers, 1980). Nguyen and Masthoff's (2007) more recent experiment explored the effect of a model's social appearance on the perceived credibility of the source. Findings suggest a positive relation between the perceived expertise of the source on a topic and the credibility of the source message (e.g. a sports teacher may not be perceived as reliable source to learn mathematics from, but might be perceived as a more reliable source to learn push-ups from than a math teacher). It may vary from person to person whether a source is perceived as experienced or not. Each recipient weighs whether the source conveying the information can be trusted, based on one's own prior knowledge and assumptions (Lacher & Nückles, 2015).

Persuasive Effect of Clothing

Related research with animated models shows that the choice of clothing influences the persuasiveness of animated pedagogical agents (Wang, & Yeh, 2013). Students perceived pedagogical agents with overtly provocative attire as attractive, yet untrustworthy and unprofessional. For the same pedagogical agents, provocative, yet more ‘classy’ attire was found to be most beneficial for effective learning (Wang, & Yeh, 2013). Such findings lead one to believe that factors such as the model’s attire could influence the model’s perceived qualities, as clothes could give learners an indication whether the model is an appropriate source of knowledge.

Feminine Clothing

Empirical evidence found by Fleischmann, Hespenheide, Weiß and Koch (2016) suggests that clothing affects the qualities attributed to a woman in a similar fashion, as it also affects the qualities attributed to animated models. Women wearing feminine clothes were perceived as having lower computer-related skills, as well as being less intelligent, less competent and less likeable compared to women wearing more neutral clothes when competing for an IT-related student job (Fleischmann, et al., 2016). Judgments on clothes have been found to influence the expected value of professional women, as they induce gender stereotypes (Lower, 2018). Lower’s (2018) research found that models in feminine attire were perceived as having less expertise and dominance, while models in more masculine clothes scored lower on perceived kindness and friendliness. These findings show that widely held beliefs about differences between women and men are deeply held in present day society, activated by feminine clothing. These findings resonate with an old Dutch proverb, ‘clothes make the man’, used to indicate that someone’s attire determines how much respect they will receive.

Clothes are a form of self-expression that give our surroundings cues about our personality, education and financial status; making it a powerful non-verbal communication tool (Lower, 2018). Bias against female teachers has been found to affect the perceived effectiveness of teachers, as in particular male students tend to give higher scores to male teachers on the quality of the course delivery style (Boring, 2017). Nevertheless Hoogerheide et al., (2018) found no significant difference between male and female models on the learning outcome and self-efficacy in VMEs when the content was kept the same. These findings suggest that there is no gender bias against male or female models in VMEs, even though the task of trouble shooting faulty electrical circuits was perceived as more appropriate for males then females. Within this study, the clothes of the models where kept equal for methodological considerations, which was not the case in the Borings (2007) study. Furthermore, Hannover and Kühnen (2002) study suggest that clothes activate stereotypes that could in turn effect the persuasiveness of the model thus affecting the efficiency of VMEs. This leads to believe that feminine clothes activate gender bias against teachers.

The Present Study

This current study investigates the effect that feminine clothing featured in VMEs has on learning and self-efficacy. Based on the literature, it is expected that feminine clothing featured in VMEs will have negative effects on learning and self-efficacy.

For the purpose of this study, troubleshooting electrical circuits was chosen as the ‘manly’ skill. Troubleshooting electrical circuits has been perceived as more appropriate for male then female models (Hoogerheide, et al., 2018; Marchand & Taasoobshirazi, 2013). The femininity of the outfit was manipulated through clothing (Fleischmann, et al., 2016). For the neutral condition a white t-shirt and black pants were worn and for the feminine clothing condition, models wore a black flower print dress. These changes could be made easily in contrast to typically feminine facial or body features. Furthermore, manipulating the outfit reduced the change of findings being attributed to variables outside of the intended manipulation as the models could be used in both conditions. The main variables determining the effectiveness of the VME were test performance and self-efficacy gains. To further reduce the chance of obtaining findings attributed to variables outside of the intended manipulation, two models were utilized per condition to rule out interpersonal variables. The VMEs were filmed following a script containing worked-out explanations, gestures and movements. In line with the theory, it is hypothesized that both male and female students will display higher performance and self-efficacy gains in the neutral clothing condition.

Several additional variables were measured to further explore the relation between the femininity of the model and the effectiveness of VME. The first additional variable measured was the invested mental effort, as it could provide insights into the cognitive efficiency of the two instruction conditions (van Gog & Paas, 2008). Secondly, perceived mind wandering, as it gives an indication whether the participants were able to stay focused on the task presented in the VMEs, which could in turn effect learning (Szpunar & Schacter, 2013). Thirdly, the self-efficacy gain was included as it affects factors like academic motivation, and learning outcomes (Bandura, 1997; Bong & Skaalvik, 2003). Fourthly, the perceived explanation quality was measured as Hoogerheide et al. (2016) suggest that perceived explanation quality could be associated with perceived expertise. Fifthly, perceived learning enjoyment was included, as authors Yi and Hwang (2003) proposed that such factor could indicate whether a VME can be used in a non-experimental context. Sixthly, perceived intelligence as it may be associated with perceived expertise (Sternberg, 1999). Finally, the perceived femininity of the models was measured to check the femininity manipulation.

Method

Participants and Design

The experiment had a between-subjects design, with Femininity of clothes (neutral vs. feminine clothing as between subject factor. An analysis (α = .05, power = .80) was conducted to determine how many participants would be needed to reliably detect a medium-sized effect revealed a minimum number of 102 participants (Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007). Two participants were removed due to high pretest scores; the final sample consisted of 79 Dutch secondary school students (41 females, 38 males; age: *M* = 15.47, *SD* = 0.55) in their fourth year of pre-university education. The students were quasi-randomly assigned across the neutral (18 females, 19 males; age: *M* = 15.54, *SD* = 0.61) vs. high femininity condition (23 females, 19 males; age: *M* = 15.40, *SD* = 0.50) based on gender, to reduce the chance of findings being attributed to gender differences. At the time of the experiment, all participants' understanding of troubleshooting electrical circuits was decidedly limited. This was ensured due to the fact that participants consisted exclusively of students that had not yet coursed a physics class involving electricity.

Materials

The materials for this study were based on scripts applied in previous studies on VME, consisting of three VMEs of four minutes in duration, about troubleshooting electrical circuits (Hoogerheide, et al., 2016; Hoogerheide, et al., 2018).

Pretest. The prior conceptual knowledge test contained seven open-ended questions concerning the topic of troubleshooting and parallel circuit principles (e.g. "What do you know about the total current in parallel circuits?"). The pretest was applied to make sure the prior knowledge was low and equally spread across the conditions. Within a pilot study two educational scientist student evaluators both scored the same ten pretests. The average measure Intra-class correlation coefficient was .957 with a 95% confidence interval from .826 to .989 (F9, 9) = 23.200, $p <$ .001). This score resembles an excellent degree of reliability found between the two measurements (Koo & Li, 2016).

Introductory text. The introductory text explained how to use the different formulas associated with Ohm's law (i.e. U = R × I; R = U/I; I = U/R). An example drawing of an electrical circuit was provided with a legend explaining how to interpret the different components of the electrical circuit drawing.

Modeling examples videos. In total, twelve VMEs were created as each of the two models made three VMEs in the high femininity and neutral clothing conditions. All models were Dutch females around 22 years old. The VMEs were filmed according to a script containing worked-out explanations, gestures and movements to reduce the chances of obtaining findings attributed to variables outside of the intended manipulation. The worked-out explanations, gestures and movements were shown on a display underneath the camera to ensure that script was followed and the VME had the same duration.

In the first VME (four minutes) the model explained that the current that can be measured in all three parallel branches could be calculated using Ohm's law. First, the model showed how to calculate the current in each of the three parallel branches. Then, the model calculated the current in each branch using the information presented in the drawing, after which the measured values were presented. These values did not match the calculated values, as there was an inconsistency in one of the branches. The model explained that the inconsistency was due to a low current, indicating that the resistance in that branch must have been higher than it should be if the circuit was functioning correctly. Finally, the model showed how to calculate the actual resistance using the measured currents, Ohm's law and the instructed problem-solving steps. The second VME (four minutes) and third VME (four minutes) used the same script as the first VME. The only difference was that the problem constituted of dissimilar values.

Feminine clothing manipulation. Both models were filmed in both the natural as feminine clothing condition. The manipulation was executed by changing the clothing worn during the VME. For the natural clothing condition, the decision was made to use a white t-shirt and a black pair of trousers as shown in Figure 1 and Figure 2. For the feminine clothing condition, the models were dressed in a flower print summer dress. All other visual cues, such as make-up, hair or accessories, remained constant.

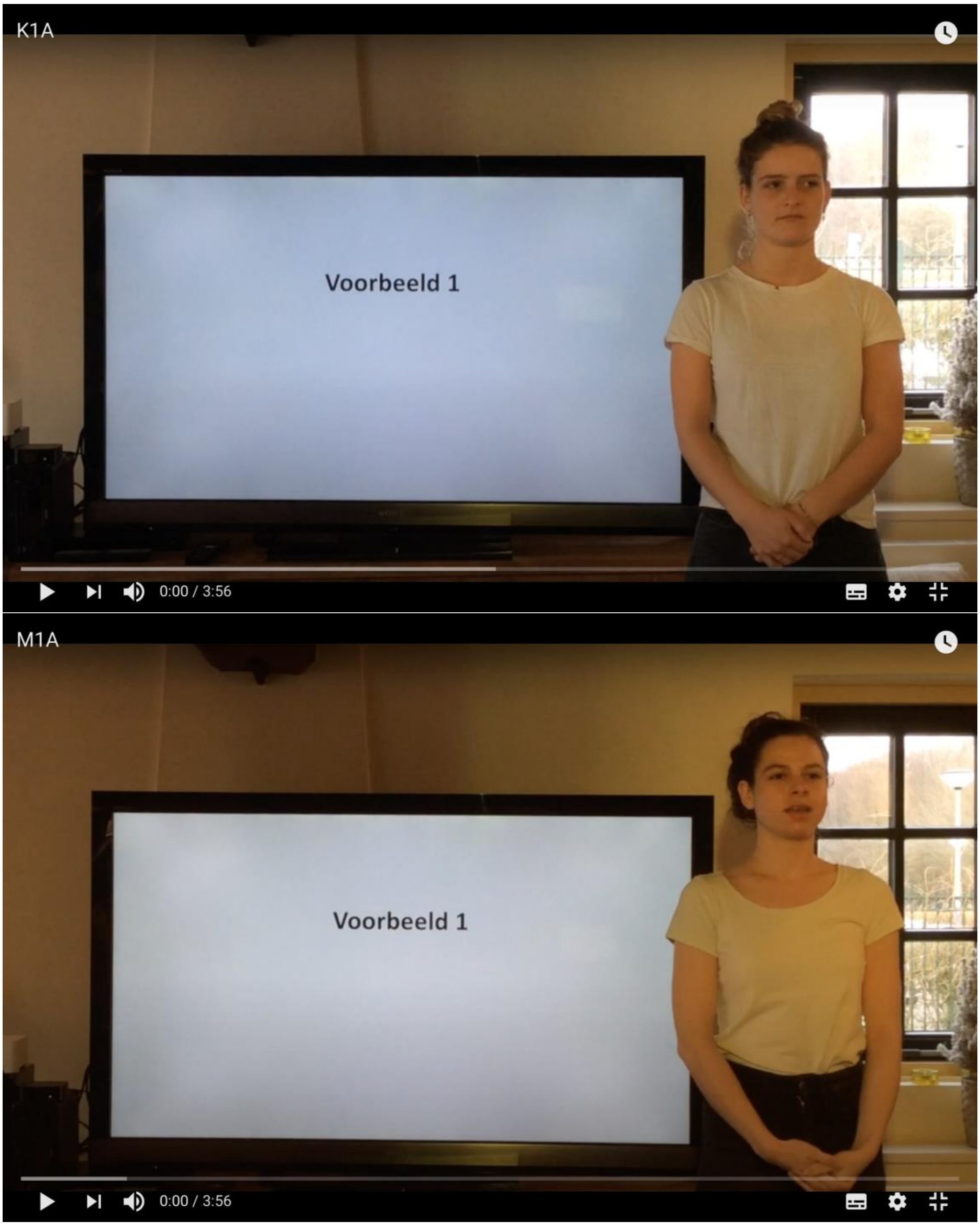

Figure 1. Screenshot of models in neutral clothes

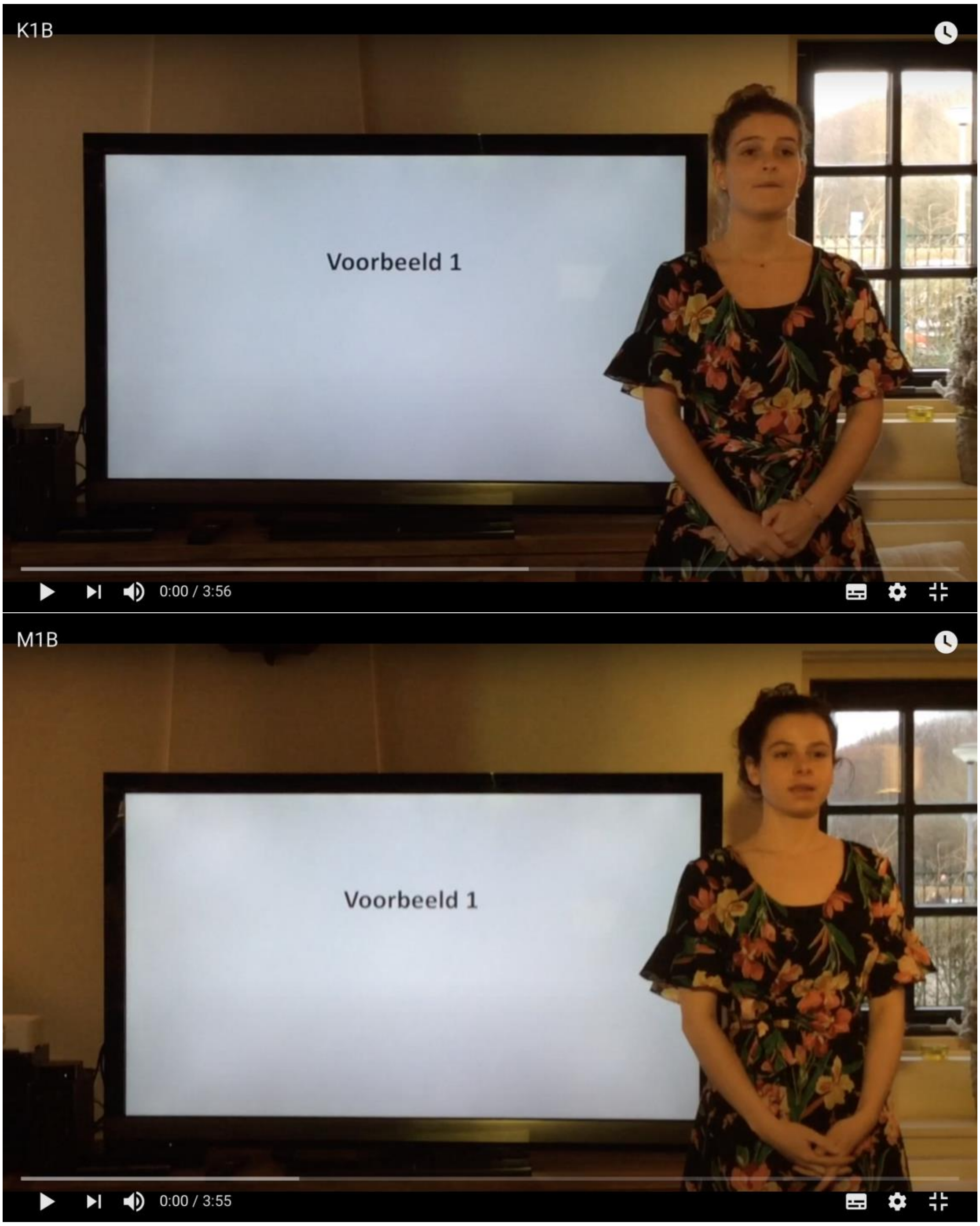

Figure 2. Screenshot of models in feminine clothes

Posttest

The posttest contained two electrical circuit-troubleshooting problems. The first troubleshooting exercise was similar to the problem explained in the VME, as it resembled a faulty electrical circuit in which a lower current was measured indicating a higher resistance. The second faulty electrical circuit contained both inconsistencies as explained in the VME making the problem more complex. With each assignment the legend was included as presented in the introductory text. Within a pilot study two educational scientist student evaluators both scored the same ten posttests. The average measure Intra-class correlation coefficient was .633 with a 95% confidence interval from -.478 to .909 (F9, 9) = 2.224, p = .076). This score resembles a moderate degree of reliability between the two measurements (Koo & Li, 2016). Since some interpretation was left to the assessor, the decision was made to have the posttest executed by a single rater to improve reliability.

Measurements

Invested mental effort. This variable was measured after each VME and each posttest task. The invested mental effort was measured using the Paas scale, which measures the mental effort on a scale of (1) very, very low mental effort to (9) resembling very, very high mental effort (Hoogerheide et al., 2018; Paas, 1992).

Perceived mind wandering. Perceived mind wandering was measured after each VME. The perceived mind wandering was measured using a 9-point Likert scale, which ranged from (1) very, very low mind wandering to (9) very, very high mind wandering.

Perceived self-efficacy. Before the pretest and after the posttest the perceived self-efficacy was measured using the self-efficacy scale conform Bandura (2006), which were previously used in Hoogerheide et al. (2018) study. The students were asked whether they had mastered the skill of detecting and solving electrical circuit problems using Ohms law on a scale of (1) not at all confident to (9) very, very confident.

Perceived explanation quality. After the VME the participants were asked to rate the quality of the explanation on a 9-point Likert scale (Hoogerheide, Loyens &

van Gog, 2016). A score of (1) resembled a very, very bad explanation quality and a score of (9) resembled very, very high explanation quality.

Perceived learning enjoyment. This variable was measured after the posttest. The students were asked how enjoyable studying both VME was for them. The students were asked to grade the VME on a scale of (1) very, very not enjoyable to (9) very, very enjoyable (Hoogerheide, et. al., 2014).

Perceived intelligence. Subsequently the VME the participants were asked to rate the intelligence of the model on a 9-point Likert scale, which ranged from (1) very, very low intelligence to (9) very, very high intelligence.

Perceived expertise. Finally, the participants were asked to rate the expertise of the model that they saw in the VME. Perceived expertise was measured on a Likert scale ranging from 1 till 9 representing a very, very low expertise to very, very high expertise.

Procedure

Before the experiment the participants were quasi-randomly allocated to one of the two models and either the neutral or feminine clothes condition, based on gender (e.g. for each female participant assigned to the neutral condition, another female participant was assigned to the high femininity condition). This way an equal number and ratio of male and females were assigned to all models and conditions. This ensured that differences could not be attribute to gender or model differences. An online randomization tool allocated a link with the designated survey condition to each participant. These links where sent to the participants by email leading them to the materials, made available on the online-based survey software tool Qualtrics (www.qualtrics.com). A note was included in this email, kindly asking participants to submit their answers to the survey in a serious manner, as well as a brief explanation on how to utilize the survey tool. All participants provided their informed consent and where instructed that they could stop with this experiment at any given time without repercussion. The experiment took place at participant's residences and took approximately 50 minutes per session. The participants were equipped with a laptop, calculator and a headset.

First, each participant received a personal link to Qualtrics, which allocated them to one of the four VME conditions. Participants were welcomed and informed that their involvement in the study was very much appreciated and stopping at any point in the experiment was possible if desired, without consequence. Then, instructions on how to use Qualtrics followed after which the students could proceed to the experiment.

The experiment consisted of five phases. The first phase, lasting around five minutes, consisted of demographic questions and the pretest followed up by the self-efficacy scale. In the second phase, the experimenter asked the participants to study the introduction text for two minutes, explicitly mentioning the importance of information in the introduction text, as it was prerequisite knowledge needed to understand the videos that would follow. In the third phase, that lasted twelve minutes, the participants were shown the three VME. After each VME the participants were asked to fill out the invested mental afford scale. In the fourth phase, which lasted twelve minutes the participants were presented with the posttest and asked to fill out the mental effort scale after each problem that was presented to them. In the fifth and final phase participants were asked to reflect on the third phase and fill out the perceived learning enjoyment, explanation quality and perceived self-efficacy questionnaires. This took two minutes, after which the participants were thanked for their participation.

Data Analysis

Test performances were scored based on a coding scheme that had been developed for previous studies (Hoogerheide, et al., 2016; Hoogerheide, et al., 2018). Within the pretest, ten points could be awarded in total, with partially correct answers receiving only a fraction of the scored points. Within the posttest, eight points could be scored in total. For the two ‘assignments’ in the posttest, the first one being less complex than the second one – points were awarded for calculating the correct values, for pointing out which resistor was faulty and for indicating what the faulty resistor’s actual value. As the second task was more complex, two points were awarded for correctly indicating both faulty resistors and two points were awarded for correctly computing the resistance. Partially correct answers were also awarded. The grading Rubric and materials used during this study can be found back in Appendix 1. After scoring the pre- and post-test scores the total pre- and post-test scores were calculated.

Then adding the three cognitive load measures recorded after the VMEs and dividing them by three calculated resulted in the mean cognitive load of the VMEs. The mean cognitive load of the two assignments the posttest constituted of was calculated in a similar fashion. Adding the three mind wandering scores measured after each VME, and dividing them by three computed the mean mind wandering score during the VMEs.

Then the assumptions for equality of variances were tested with the Levene’s test. Analyzing whether the z-scores of skewness and kurtosis lay between -1.96 and 1.96, and conducting the Shapiro-Wilk test checked for the normality of the data. After the assumptions of the data were checked it was analyzed whether the prior knowledge was different between the experimental and control condition, participants with a prior knowledge score higher than 5 were excluded from further analyses. Then the femininity manipulation was checked after which the outcome variables where analyzed with between subjects Mann-Whitney U test. Further it was analyzed whether the self-efficacy had increased within the experimental and control condition. Finally, effect sizes were calculated using Pearson's correlation coefficient *r*. The Pearson's correlations where interpreted using the guidelines as described in field (2013), *r* .10 resembled a small effect, .30 a medium effect, and .50 a large effect.

Results

Preliminary Tests

Normality of data. The data were analyzed with non-parametric tests. The z-values for skewness and kurtosis for the majority of variables were under -1.96 or over 1.96 giving another indication that the data was not normally distributed (Field, 2013). Further analyses with the Shapiro-Wilk test for normality was significant, indicating that the assumption of normally distributed data was violated for performance pretest ($W(79) = .97$, $p = .039$), performance posttest ($W(79) = .83$, $p < .001$), mental effort study phase ($W(79) = .96$, $p = .014$), mental effort posttest ($W(79) = .96$, $p = .015$), self-efficacy pretest ($W(79) = .82$, $p < .001$), self-efficacy posttest ($W(79) = .95$, $p = .005$), explanation quality ($W(79) = .90$, $p < .001$), learning enjoyment ($W(79) = .90$ $p < .001$), intelligence model ($W(79) = .86$, $p < .001$), expertise ($W(79) = .90$, $p < .001$), femininity model ($W(79) = .94$, $p = .001$). The variable for mind wandering study phase ($W(79) = .98$, $p = .272$) was the only normal distributed variable, hence for continuity it was also analyzed with non-parametric tests.

Inter-model differences. After establishing the normality of the data, two further preliminary tests were conducted. An initial revision of whether there was no difference between the two models by means of independent samples Mann-Whitney U tests on all outcome variables was conducted. As shown in Table 1, no significant differences between the models were found. Therefore, the decision was made to proceed with further analyses on a condition level.

Table 1

Results Mann-Whitney U test on all outcome variables between model A and model B.

	Mdn model A	*Mdn* model B	*U*	*p*	*r*
Performance Posttest	4.00	3.00	774.50	.956	>-.01
Mental Effort Study Phase	3.33	3.83	738.00	.679	.05
Mental Effort Posttest	5.00	3.50	653.50	.213	-.14
Self-efficacy Posttest	5.00	5.00	718.50	.539	-.07
Mind wandering Study Phase	5.67	5.83	767.50	.902	.01
Explanation Quality	7.00	7.00	696.50	.396	-.10
Learning Enjoyment	5.00	4.00	727.50	.598	-.06
Intelligence Model	6.00	6.00	700.50	.421	-.09
Expertise Model	6.00	5.00	709.50	.481	-.08
Femininity Model	7.00	6.00	635.00	.148	-.16

Prior knowledge. Whether participants' prior knowledge was indeed low, and did not differ amongst the feminine and neutral clothing condition was also checked.

Prior knowledge was indeed low except for two participants that were excluded from further analyses based on the condition that no participants pretest score should not be higher than 5.5, resulting in a new sample of 77 students (39 females, 38 males; age: *M* = 15.47, *SD* = 0.55) divided over the neutral (17 females, 19 males; age: *M* = 15.53, *SD* = 0.61) and high femininity clothing condition (22 females, 19 males; age: *M* = 15.41, *SD* = 0.50). There was no significant effect for clothing condition on the prerequisite knowledge on the topic of troubleshooting electrical circuits, $U = 586.50$, $p = .117$, $r = -.18$, even though the performance on pretest scores differed slightly between the neutral (median = 3.00) and feminine clothing condition (median = 2.50), as shown in Table 2.

Table 2

Mean, standard deviation and median of test performance, invested mental effort, self-efficacy, mind wandering, explanation quality, learning enjoyment, intelligence, and femininity per condition.

	Neutral condition			Feminine condition		
	M	*SD*	*Mdn*	*M*	*SD*	*Mdn*
Performance Pretest (Range 0-10)	2.79	.98	3.00	2.42	1.03	2.50
Performance Posttest (Range 0-8)	4.31	3.23	4.00	3.89	3.25	3.00
Mental Effort Study Phase (Range 1-9)	3.76	1.80	3.17	4.03	1.63	4.00
Mental Effort Posttest (Range 1-9)	4.00	1.99	3.50	4.83	2.31	5.00

Self-efficacy Pretest (Range 1-9)	4.44	2.80	4.00	4.49	3.07	4.00
Self-efficacy Posttest (Range 1-9)	4.81	1.72	5.00	4.63	1.67	5.00
Mind wandering Study Phase (Range 1-9)*	5.74	1.66	5.83	5.87	1.93	5.67
Explanation Quality (Range 1-9)	6.94	1.41	7.00	6.73	1.57	7.00
Learning Enjoyment (Range 1-9)	4.33	2.20	5.50	3.71	2.19	3.00
Intelligence Model (Range 1-9)	5.42	1.95	6.00	5.98	1.48	6.00
Expertise Model (Range 1-9)	4.92	2.23	5.00	5.17	1.72	6.00
Femininity Model (Range 1-9)	4.94	1.66	5.00	7.05	1.10	7.00

* Data was normally distributed.

Experimental Outcome Variables

Manipulation check. It was then checked whether the manipulation of perceived femininity was successful. The Mann-Whitney U-test was significant, U = 216.50, p < .001. The effect size was r = .62, indicating a large effect. Meaning that the femininity of the model was significantly higher in the feminine clothing condition (median = 7.00) than in the neutral clothing condition (median = 5.00).

Posttest performance. To check whether the clothes worn in a VME affected the learning outcome. The learning outcome was measured with the posttest, and performance scores were compared between the clothing conditions. Numerically the experimental condition (median = 3.00) scored lower than the control condition (median = 4.00). The Mann-Whitney U-test however indicated that the posttest performance was not significantly greater for participants in the neutral clothing condition than for participants in the feminine clothing condition, $U = 688.00$, $p = .603$ $r = .06$.

Mental effort. Two independent Mann-Whitney U-tests were executed to compare whether invested mental effort in the study phase (neutral condition: median = 3.17, feminine condition: median = 4.00) and invested mental effort during the posttest (neutral condition: median = 5.00, feminine condition: median = 5.00) differed in the neutral and feminine clothing condition. Both the invested mental effort in the study phase ($U = 645.00$, $p = .341$ $r = .11$), and invested mental effort during the posttest ($U = 578.50$, $p = .102$ $r = .19$) were not significant.

Self-efficacy. The Wilcoxon signed-rank test was applied to check whether within each experimental condition the self-efficacy had increased after watching the VMEs. The analyses of self-efficacy showed that within the neutral clothing condition the self-efficacy was not significantly higher after watching the VME (median = 5.00) than before watching the VME (median = 4.00), $z = -1.114$, $p = .265$, $r = .19$. This was also the case in the feminine clothing condition, where the self-efficacy was not significantly higher after watching the VME (median = 5.00) than before watching the VME (median = 4.00), $z = -.876$, $p = .381$, $r = .14$. For both conditions count that numerally the self-efficacy increased. A small effect size was found, even though the difference was not significant.

It was then checked whether the pre VME self-efficacy dissimilar within both clothing conditions. The Mann-Whitney U-test was not significant, $U = 713.00$, $p =$

.795, *r* = -.03, indicating that there was indeed no significant difference between the pre VME self-efficacy score between the neutral (median = 4.00) and feminine (median = 4.00) clothing condition.

After establishing that the pre VME self-efficacy was the significantly different between both conditions an independent Mann-Whitney U-test was executed to compare whether post VME self-efficacy was higher in the neutral condition (median = 5.00) than in the feminine clothing condition (median = 5.00). The difference between the post VME self-efficacy between the clothing conditions was not significant, *U* = 689.50, *p* = .614, *r* = .06.

Explanation quality. It was then analyzed whether the femininity of the models clothes in a VME affected the perceived explanation quality. The Mann-Whitney U-test was not significant, *U* = 675.50, *p* = .509, *r* = .08, showing that the perceived explanation quality was not higher in the neutral clothing condition (median = 7.00) than in the feminine clothing condition (median = 7.00).

Learning enjoyment. The Mann-Whitney U-test indicated no significant difference on learning enjoyment, *U* = 609.00, *p* = .177, *r* = -.15, between the neutral clothing condition (median = 5.50) and the feminine clothing condition (median = 3.00). A small effect was found; indicating that the participants within the feminine clothing condition had a lower learning enjoyment than the participants in the neutral condition enough the difference was not significant.

Intelligence. It was tested whether the model wearing neutral clothing compared to the model wearing feminine clothing was perceived as being more intelligent. The Mann-Whitney U-test was not significant, *U* = 624.50, *p* = .232, showing that the perceived explanation quality was not significantly higher in the neutral clothing condition (median = 6.00) than in the feminine clothing condition (median = 6.00). The effect size *r* = -.14, indicated a small effect, meaning that the models in the feminine clothing condition where perceived as being slightly more intelligent, even though the difference was not significant.

Expertise. Lastly, it was analyzed whether the model in the neutral clothing condition (median = 5.00) was perceived as having more expertise then the model in the feminine clothing condition (median = 6.00). The Mann-Whitney U-test indicated no significant difference between the perceived expertise between the two clothing conditions (*U* = 714.00, *p* = .803, *r* = -.03).

Discussion

This current study investigated the effect that feminine clothing featured in VMEs has on learning and self-efficacy. Students were shown the same VMEs in which the information was kept the same, presented by a model wearing either feminine or neutral clothes. Within both clothing conditions, half of the participants were shown VMEs with model A and the other half were shown VMEs with model B. This ensured that finding could not be attributed to differences between the models as in both the neutral and feminine clothing condition, as the same two models were shown. The clothing manipulation was successful, as participants perceived and reported a higher femininity for the models in the feminine clothing condition.

Based on studies by Fleischmann et al. (2016) and Lower (2018), it was hypothesized that feminine clothing featured in VMEs explaining a conventionally ‘manly’ skill will induce the source to be perceived as less intelligent and of less expertise, making the source less appropriate to learn from. A source that is perceived as less appropriate to learn form could potentially result in a negative effect on the learning outcome and self-efficacy (Wang & Yeh, 2013). The results of this study showed no negative effect of feminine clothing featured in VMEs on the learning outcome and self-efficacy, as no significant differences were found between the experimental clothing conditions. Furthermore, no significant dissimilarity was found between the neutral and feminine clothing condition on mental effort, explanation quality, learning enjoyment, intelligence or expertise.

Interpretation and subsequent insights drawn from the data analysis must be done within consideration of the context on which this study occurred. Given the emergence of COVID-19 across the globe, social distancing and mandatory quarantine significantly shaped the data collection process. This led to some methodological shortcomings and limitations. The reduced sample size yielded insufficient statistical power, lower than .80, for the main outcome variables (Post-hoc power: Learning Outcome: .06; post VME self-efficacy .06). There was a numerically different score on test outcome for the neutral compared to the feminine clothing condition. This low power potentially shaped the obtained analysis outcomes, resulting in a false negative (Cohen, 1992).

Furthermore, no significant increase in self-efficacy was found within the neutral and feminine clothing condition. Previous studies on VMEs did find a significant increase in self-efficacy, by utilizing the same materials (Hoogerheide, et al., 2016; Hoogerheide, et al., 2018). These findings raise the question of whether participants actually learned from the three VMEs displayed during the study phase of this experiment, even though this study offered an additional VME than in previous studies (Hoogerheide, et al., 2016; Hoogerheide, et al., 2018).

Since most of the data was not normally distributed, no analyses weighing in the prerequisite knowledge was possible. Prior knowledge was not significantly different between the neutral and feminine clothing condition, but did differ numerically, although slightly. Therefore, possible differences on other outcome variables between the control and experimental condition could potentially be attributed to dissimilar prerequisite knowledge between the clothing conditions, as this could not be compensated for.

Additionally, a limitation of the current study is that not all variables could be controlled for during the experiment. Due to the current pandemic, participants where administered a survey which had to be filled in without assistance and in a home setting. It is possible that environmental factors such as a buzzing phone or playing siblings in the background, could have distracted the participants during the experiment, influencing their ability to learn (Chen & Yan, 2016; Fox, Rosen, & Crawford, 2009; Klatte, Bergström, & Lachmann, 2013).

A first alternative explanation of the result could be the step-by-step and short-duration nature of VMEs, as it leaves little room for the learner to get distracted by irrelevant information for problem solving. These VME characteristics could help explain why no significant difference was found between the neutral and feminine clothing condition. Signaling by the model in an instruction video has previously been proven to guide the attention of the learner to relevant information (Mautone & Mayer 2001; Schneider, Beege, Nebel, & Rey, 2018). Step-by-step guidance like this allows novice learners to not become sidetracked by irrelevant information and has been proven to affect learning in a positive way (Sweller, Ayres, & Kalyuga, 2011). The high amount of signaling and step-by-step guidance in a VME may also direct the attention away from the models clothing, as this is also irrelevant information for solving the problem at hand. Therefore, no judgment based on the clothes is made and the learning outcome and self-efficacy remain unaffected, as shown by the results of this study. Clothes have been found to influence perceptions and learning outcomes in live class settings (Craig & Savage 2014; Morris, Gorham, Cohen, & Huffman, 1996).

Perhaps this is due to these classes' longer duration that mind wandering increases, as a function of time (Farley, Risko, & Kingstone, 2013; Risko, Anderson, Sarwal, Engelhardt, & Kingstone, 2012; Thomson, Seli, Besner, & Smilek, 2014). Therefore, it is possible that longer instruction videos, like video lectures, could be influenced by the femininity of the models' clothes, as there is more time to get distracted by irrelevant information, like the lecturer's clothes. If the lecturer's attire gets attention, then the perceived intelligence and expertise may be affected, in turn affecting the learning outcome and self-efficacy.

A second possible explanation could be that the perceived ages of the models in the VMEs seemed inappropriate for explaining how to trouble shoot faulty electrical circuits. This in turn could have affected the perception of the models, affecting their appropriateness to learn form in the eyes of the participants (Bandura, 1986; Hoogerheide et al., 2016; Schunk, 1987). A previous study on the effectiveness of VME utilizing similar stimulus materials found a significant effect for the models' age on learning outcome (Hoogerheide, et al., 2016). These results were possibly explained by higher learner efficiency for adult models compared to peer models (Hoogerheide, et al., 2016; Van Gog & Paas, 2008). Adult model explanations yielded lower mental effort scores and higher explanation quality, even though the explanations were scripted and kept the same between the peer and adult age conditions. In the present study, there is the possibility that task-appropriates and explanations of quality perception were negatively affected by the age of the models in the stimulus materials in a similar fashion as in Hoogerheide et al., (2016) study. Possible negative effects of the models' attire could have thus been redundant, as audience perceptions on quality of the models' explanation were already low.

Future researchers should consider these limitations and alternative explanations, when approaching the study of VME models. Sampling should be done at greater scale and environmental factors should be controlled for, to ensure that possible differences can be reliably detected. Adding a longer online video lecture condition next to the VME condition would allow the first possible explanation of the results of the current study to be tested. Furthermore, the stimulus materials should include more mature-looking models/ visibly older models to prevent age to negatively affect the task-appropriate and explanation quality perception of the models making the clothes manipulation redundant. The exploration of seemingly minute details of VME models, such as a model's perceived age or outfit choice holds interesting prospects for future research.

A second suggestion for future research would be to investigate what model type do students prefer to learn difficult /easy skills from, choosing between variables such as gender, age, and femininity or formality of clothes. This could be explored by looking at clicking behavior in a simulated informal online environment, similar to YouTube. Participants would be presented a series of two video thumbnails showing a picture of the models and the skill to be taught in the video title. Then, students would be asked to choose the video that they would prefer to watch when given the opportunity to choose between these two videos. Since it only takes a click to decide what model would be preferred, a series of diverse models and clothing manipulations could be checked. This could result in new insides in the student's model preference that could potentially reveal biases in favor of certain model characteristics on VME teaching an easy or difficult skill.

In sum, the present study's findings suggest that the femininity of the models clothes is not an important factor that should be taken into account when designing

VMEs for secondary school students. These results were found despite the content of the VMEs possibly being perceived as more appropriate to be taught by a model wearing neutral clothes compared to feminine clothes. On a societal level, these findings strengthen the fact that teachers and policy makers cannot discriminate against the femininity of personal clothing choices when making VMEs for secondary school settings. From an academic perspective, these findings contribute to a better understanding of how a model’s clothing affect students’ learning from VMEs. Future research should help discover whether these results could apply within different student populations, as there is still a pressing need for a better understanding, and thus more research on whether, and when model variables like clothing affect how much students learn from VMEs.

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Appendix 1 – Grading Instructions

Instructies voor scoren

SCORING PRETEST

Maximum totaal score: **10 punten**

1. Hoe zou je het troubleshooten (= fouten opsporen en repareren) van een elektrische schakeling aanpakken? (4 punten)

1 punt: berekenen wat je zou moeten meten

1 punt: meten

1 punt: vergelijken en bepalen waar fout zit

1 punt: repareren

2. Wat weet je van de totale stroom in een parallelschakeling?

1 punt: Som van de deelstromen; som van de stroom in de paralleltakken

½ punt: totaal van alle schakelingen

3. Wat is er waarschijnlijk aan de hand als je in een parallelschakeling nergens stroom meet?

1 punt: oneindig hoge weerstand (= opening) *buiten de paralleltakken*

½ punt: veel te hoge weerstand; open; niet goed aangesloten/stuk/kapot

4. Als de totale stroom in een parallelschakeling lager is dan je zou verwachten, wat weet je dan van de weerstand in die schakeling?

1 punt: die is hoger dan je zou verwachten; die is te hoog

½ punt: hoog

5. Wat is er waarschijnlijk aan de hand als je in een parallelschakeling/-tak oneindig grote stroom meet?

1 punt: Oneindig lage weerstand; geen weerstand; kortsluiting

½ punt: veel te lage weerstand

6. Wat is er waarschijnlijk aan de hand als je in één paralleltak geen stroom meet?

1 punt: oneindig hoge weerstand (= opening) *in die paralleltak*

½ punt: veel te hoge weerstand; niet goed aangesloten/stuk/kapot

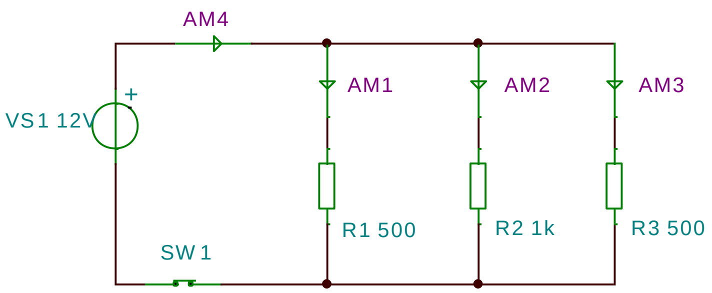
7. Als de totale stroom in een parallelschakeling hoger is dan je zou verwachten, wat weet je dan van de weerstand in die schakeling?

1 punt: Die is lager dan je zou verwachten; die is te laag

½ punt: laag

SCORING POSTTEST

Probleem 1: Totaal max. 3 punten



1. Bereken met behulp van de wet van Ohm hoe de hierboven afgebeelde schakeling <u>zou</u> moeten functioneren, dus wat je zou moeten meten bij de Ampèremeters AM 1 t/m AM4.

De totale stroom zou dus moeten zijn: $I_t = I_1 + I_2 + I_3 + I_4$

ofwel: $I_t = \frac{U}{R_1} + \frac{U}{R_2} + \frac{U}{R_3} = \frac{12V}{500\Omega} + \frac{12V}{1k\Omega} + \frac{12V}{500\Omega}$ = 24mA + 12mA + 24mA = 60mA

Max score: 1 punt
1 punt: 24mA + 12mA + 24mA = 60mA (of alleen 24 + 12 + 24 ook goed rekenen)
½ punt voor alleen 12/500+ 12/1k + 12/500

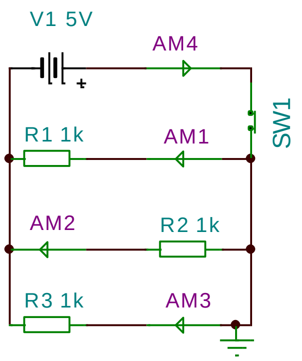
2. Stel dat je het volgende meet:

AM1 = 12*mA* AM2 = 12*mA* AM3 = 24*mA* AM4 = 48*mA*

3. Wat is de fout en in welke component zit die?

Max score: 2 punten
1 punt: weerstand R1 te hoog/te groot (½ punt als ze zeggen: AM1 te laag)
1 punt: R1 is 1k Ohm ipv 500 Ohm (wanneer ze alleen 1k Ohm noemen ook goed en wanneer ze alleen formule geven R = U / I maar deze nog niet uitgerekend hebben
Max score: 1 punt

Probleem 2: Totaal max. 5 punten



1. Bereken met behulp van de wet van Ohm hoe de hierboven afgebeelde schakeling zou moeten functioneren, dus wat je zou moeten meten bij de Ampèremeters AM 1 t/m AM4.

De totale stroom zou dus moeten zijn: $I_t = I_1 + I_2 + I_3 + I_4$

ofwel: $I_t = \frac{U}{R_1} + \frac{U}{R_2} + \frac{U}{R_3} = \frac{5V}{1k\Omega} + \frac{5V}{1k\Omega} + \frac{5V}{1k\Omega}$ = 5mA + 5mA + 5mA = 15mA

Max score: 1 punt
1 punt: 5mA + 5mA + 5mA = 15mA (of alleen 5mA + 5mA + 5mA ook goed rekenen)
½ punt voor alleen 5/1 + 5/1 + 5/1

2. Stel dat je het volgende meet:

AM1 = 5mA AM2 = 2,5mA AM3 = 7,5mA AM4 = 15mA

3. Wat is de fout en in welke component zit die?

Max score: 4 punten
1 punt: weerstand R2 te hoog/te groot (½ punt als ze zeggen: AM2 te laag)
1 punt: R2 is 2k Ohm ipv 1k Ohm (wanneer ze alleen 2k Ohm noemen ook goed en wanneer ze alleen formule geven R = U / I maar deze nog niet uitgerekend hebben ook goed)

1 punt: weerstand R3 te laag/te klein (1/2 punt als ze zeggen: AM3 te hoog)

1 punt: R3 is 0,67 Ohm ipv 1k Ohm (wanneer ze alleen 0,67 Ohm noemen ook goed en wanneer ze alleen formule geven R = U / I maar deze nog niet uitgerekend hebben ook goed)

Appendix 1 – Ethics From

Section 1: Basic Study Information

1. Name student:

Corné Stoop

2. Name(s) of the supervisor(s):

Vincent Hoogerheide

3. Title of the thesis (plan):

The Effect of Feminine Clothing Featured in a Video Modeling Example on Learning and Self-efficacy

4. Does the study concern a multi-center project, e.g. a collaboration with other organizations, universities, a GGZ mental health care institution, or a university medical center?

Yes / **No** If yes: Explain.

5. Where will the study (data collection) be conducted? If this is abroad, please note that you have to be sure of the local ethical codes of conducts and permissions.

The Netherlands

Section 2: Study Details I

6. Will you collect data?

Yes / No **Yes → Continue to question 11** No → Continue to question 7

Section 3: Participants

7. What age group is included in your study?

Secondary education students

8. Will participants be recruited hat are > 16 years?

   Yes/No

9. Will participants be mentally competent (wilsbekwam in Dutch)?

   Yes/No

10. Does the participant population contain vulnerable persons?

    (e.g., incapacitated, children, mentally challenged, traumatized, pregnant)

    Yes/**No**

11. If you answered ‘Yes’ to any of the three questions above: Please provide reasons to justify why this particular groups of participant is included in your study.

* I feel like item 13 is questioned inverted. I do expect all participants to be Mentally competent. The current study focused on secondary students so students my be under the age of 16.

12. What possible risk could participating hold for your participants?

There will be no mental nor physical risk during this research. It could be that the information provided during the study could confuse the students when later discussing the topic in class.

13. What measures are implemented to minimize risks (or burden) for the participants?

Only factual correct knowledge will be shown to the participants.

14. What time investment and effort will be requested from participants?

Expected is that the study will ask a time investment of 30 minutes from the participants.

15. Will be participants be reimbursed for their efforts? If yes, how? (Financial reimbursement, travelling expenses, otherwise). What is the amount? Will this compensation depend on certain conditions, such as the completion of the study?

No reimbursement will be given to the participants in this study.

16. How does the burden on the participants compare to the study's potential scientific or practical contribution?

Considering the stakes of mental or physical harm are low and the study building on current knowledge the investment on return seems very positive.

17. What is the number of participants? Provide a power analysis and/or motivation for the number of participants. The current convention is a power of 0.80. If the study deviates from this convention, the FERB would like you to justify why this is necessary.
(Note, you want to include enough participants to be able to answer your research questions adequately, but you do not want to include too many participants and unnecessarily burden participants.)

According to the power analyses executed 102 (51 per condition) would be perfect. Realistically speaking I will try to get as close to that as possible.

18. How will the participants be recruited? Explain and attach the information letter to this document.

To be determent

19. How much time will prospective participants have to decide as to whether they will indeed participate in the study?

7 days

20. Please explain the consent procedures. Note, active consent of participants (or their parents) is in principle mandatory. Enclose the consent letters as attachments. You can use the consent forms on Blackboard.

Yes

21. Are the participants fully free to participate and terminate their participation whenever they want and without stating their grounds for doing so? Explain.

Yes they can terminate participation at every moment.

22. Will the participants be in a dependent relationship with the researcher?

No

23. Is there an independent contact person or a general email address of a complaint officer whom the participant can contact?

There will be space to give feedback. This feedback is not evaluated by an independent contact person but by the researcher since it's a low risk study

24. Is there an independent contact person or a general email address of a complaint officer whom the participant can contact in case of complaints?

There will be space to give feedback. This feedback is not evaluated by an

independent contact person but by the researcher since it's a low risk study.

Section 4: Data management

25. Who has access to the data and who will be responsible for managing (access to) the data?

Only the researcher

26. What type of data will you collect or create? Please provide a description of the instruments.

The experiment will be executed though a take at home survey delivered in Qualtics.

27. Will you be exchanging (personal) data with organizations/research partners outside the UU?

No

28. If so, will a data processing agreement be made up?

Yes / **No**: Standard data management guidelines provided by the university will be used.

29. Where will the data be stored and for how long?

The data will be deleted after the thesis finished with a passing grade.

30. Will the data potentially be used for other purposes than the master's thesis? (e.g., publication, reporting back to participants, etc.)

No

31. Will the data potentially be used for other purposes than the master's thesis? (e.g., publication, reporting back to participants, etc.)

No