



The Impact of the Master's Program ZukunftsDesign on Student Creativity

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Abstract. This research examined the impact of the Master's program ZukunftsDesign on student creativity. The subjective and objective creativity of 42 students were evaluated by means of an online questionnaire and external personality assessment. Findings confirmed the direct link between subjective and objective creativity. The study also revealed promising results for the Master's program and its students. More in-depth research is required to manifest the identified trends and provide detailed practical and theoretical implications.

Keywords: Creativity assessment · Creative self-image · Teaching innovation

1 Introduction

Students need certain competencies to generate innovations that will endure the environment of a rapidly changing VUCA (versatile, uncertain, complex, ambiguous) world [1]. Creativity is an important precondition for innovation [2], as it includes the ability to think of new, unexpected, and appropriate solutions and products [3]. One of the goals of the Master's program ZukunftsDesign (Eng. FutureDesign) is to teach and promote creativity. Previous qualitative studies have examined specific methods of promoting creativity and their effect on students and their creative self-efficacy [4, 5]. The overall aim of the current study was to examine whether the Master's program ZukunftsDesign influences student creativity. In particular, this research was designed as a pilot-study to identify the impact of the experiences gained within the Master's program on student creativity and investigate the development of student creativity over the course of the degree.

2 Theoretical Background

2.1 Definition of Creativity

In science and practice the perceived importance of creativity for individual, societal, and also organizational success is growing, driving research on the personal, social, and

situational conditions of creative performance (cf. [2]). Therefore, a variety of definitions of creativity exist, which emphasize its different dimensions. Some of them only address the quality of the product and the process, such as unique, useful [6], novel-original and adaptive to reality [7, 8]. Other definitions focus on the creative person(s) individually or within a small group of individuals [3], or highlight the aspect of interaction of personal, social, and situational conditions [9].

2.2 Master's Program ZukunftsDesign

The Master's Program ZukunftsDesign (ZD) is an extra-occupational degree for innovation. ZD aims at collaborative cooperation and wants to create interfaces of scientific disciplines to "systematically tackle changes, uncertainty, and complexity" [10]. Throughout the program students work on their own ideas and project topics set by regional companies and institutions in a unique inter- and trans-disciplinary environment. This opens students' minds for new ideas and promotes a "pro-entrepreneurship attitude" [10]. According to the ZD teaching concept, the conscious confrontation with opposing positions and contradictions delivers impulses for new ways of thinking. The diverse contents of the academic program range from innovation technologies and ethical questions to aspects of project group dynamics and their communication structures to teach the students how to deal with uncertainty (i.e., *VUCA thinking*). To achieve this, ZD breaks through the traditional hierarchy between professors and students. Teachers guide through projects as coaches and the curriculum is aligned with the situational needs of the students and relies on "learning by doing" to foster forward-looking, innovation-oriented skill development and change management [10].

The various elements of the program can be assigned to Rhodes' 4p model, *person*, *process*, *product*, and *press* [11]. The setting of interdisciplinary project teams of very different age groups and experience horizons, thrown together by lottery, form the *press*. Aspects of the *process* are covered in Innovation Techniques and Theory, taught and accompanied in application by coaches, and supported by a digital method toolbox for agile project work. Project results (e.g., prototypes) are the *products*. The *person* is the focus of the subjects communication and mediation, team dynamics, experience of one's own limits, and leadership.

2.3 Assessment of Creativity

According to Rhodes the *creative person* is one of the basic elements of creativity [11]. One approach to assessing creativity at the personal level is through the survey of creative self-image. A person's self-image reflects the extent to which they view themselves as creative [12]. This self-assessment serves to predict the motivation to be creative, acts as a guiding goal in creative activities, and can also shape self-selection in professional (choice) processes [13]. When considering the creative person, both cognitive aspects and aspects of personality can be examined. Since there are many components associated with creativity, this study focuses on *cognitive flexibility*, *curiosity* and *openness to experience*:

- *Curiosity*: the recognition, pursuit, and intense desire to explore novel and uncertain events [14].
- *Openness to experience*: a Big Five personality trait, which is considered a promoter of creativity [7, 15, 16].
- *Cognitive flexibility*: the ability to switch cognitive sets to adapt to changing environmental stimuli [17]. In the literature, *flexibility* and *adaptation* are often used interchangeably. The importance of adaptation is emphasized here: “Creative thought or behavior must be both novel-original and useful adaptive” [7] and “if a response is to be called original [...] it must be to some extent adaptive to reality” [8]. In particular, the aspect of the ability to adapt seems to be crucial for the ability to innovate as the fit into the market is indispensable for a successful innovation.

2.4 Image Based Tests

Interpersonal differences are primarily measured by means of psychometric tests in verbal form [18]. However, psychometric tests are criticized for their inability to engage the test taker [19], the ease of faking responses [20], and adverse impact [21]. Recently, interest in alternative forms of assessment has been growing [22]. In particular, the use of image-based testing to assess individual differences has increased substantially. Supporters argue that they offer a more engaging alternative to text-based psychometric tests [23]. One possibility to explain this is that images are more vivid than texts. However, studies based on this hypothesis have not been able to prove a “vividness effect”. Rooted in social psychology, this effect describes information as “vivid” if it is emotionally stimulating, tangible and challenging (imagery-provoking), and is close in sensory, temporal or spatial terms [24].

Leutner et al. developed an image-based creativity test, which is based on the following three measures [23]: 1. *Curiosity and Exploration Inventory-II* (CEI-II; [14]), measures two traits: stretching (e.g., ‘I actively seek as much information as I can in new situations’) and embracing (e.g., ‘I am the type of person who really enjoys the uncertainty of everyday life’). 2. *Cognitive Flexibility Inventory* (CFI; [25]), a self-report measure of adaptive thinking in stressful situations, which assesses behaviours related to alternatives (e.g., ‘I consider multiple options before making a decision’), behaviours related to control (e.g., ‘When I encounter difficult situations, I feel like I am losing control’), and 3. *Openness to experience* [26] (e.g., ‘I enjoy hearing new ideas’). This image-based test is part of the Red Bull Wingfinder personality assessment (WF). The WF is based on psychological research and focuses on components important to employability and career success for knowledge-based jobs. Its four core components are *drive*, *creativity*, *connection* and *thinking* [27].

The WF includes many dimensions that are interesting against the background of the study program and provides an unconventional and engaging approach compared to an ordinary and uninspiring student survey. Thus, pairing this form of assessment with the current study was deemed suitable to investigate the creativity of the ZD students. Examining the influence of ZD on students’ self-perceived creativity is relevant to laying the groundwork for further research in the field of teaching innovation.

3 Methods

At the time this research was carried out a total of 137 students were enrolled in the Master's program ZukunftsDesign at the Coburg University of Applied Sciences and Arts in Germany. All students were asked to participate in the study by means of an online questionnaire. In addition to demographics and subjective questions relating to the Master's program as well as self-rated creativity, the creativity of participants was measured objectively as part of the WF. The WF results range from 1–100 and are adjusted to the RedBull global norming group. Due to the focus of this research only the creativity component of the WF was included in the analysis. Creativity is a summary measure of the sub-components *cognitive flexibility*, *curiosity* and *openness to experience*, which showed good scale reliability (Cronbach's $\alpha = .76$).

The creative self-image was measured by including questions about the participants' self-rated creativity (e.g., 'how creative are you', 'how creative are you compared to your fellow students'). Participants assessed these items on a 5-point Likert scale (1 = *not creative at all*; 5 = *very creative*). Scores on items were combined to form an overall measure of students' creative self-image. The resulting scale was internally consistent with a Cronbach's α of .77.

Responses were analyzed using SPSS to investigate any trends, underlying structures and relationships between variables, in particular between subjective and objective creativity in view of ZD. Only fully completed surveys were included, entries that showed consistent missing values were deleted. Correlations were used to examine associations between variables and Analysis of Variance (ANOVA) was calculated to identify existing differences between mean scores.

3.1 Participants

Forty-two students fully completed the questionnaire (25 females, 17 males). Due to multiple inconsistent responses one female participant was removed from the data set ($N = 41$). The majority of participants were within the 21–29 years of age category (20; 48.8%), 11 (26.8%) were aged 30–39, eight (19.5%) were aged 40–49 and two participants were aged 50–59 (4.9%). Thirteen (31.7%) participants were currently studying in their first semester. The highest academic degree of most students was a Bachelor's degree (26; 63.4%). Most participants (26; 63.4%) stated that they were currently employed with weekly working hours exceeding 35; only four (9.7%) participants were unemployed.

The majority of students (90.2%) agreed that ZD encourages creativity, only four (9.8%) were undecided. Further, 34 (82.9%) participants stated that the program has a positive effect on their individual creativity; none reported negative effects. Of the 41 students 68.3% agreed with the results of the WF, while only four (9.7%) disagreed.

4 Results

The ANOVA results indicated several significant differences between female and male participants. Females ($M = 4.17$; $SD = 0.64$) found themselves to be more creative

compared to their private sphere than males, $p = .04$. Additionally, females provided significantly higher scores when asked about the importance of creativity for their current job (females: $M = 3.83$, $SD = 1.34$; males: $M = 2.82$, $SD = 1.29$; $p = .02$).

Another difference was detected for the WF creativity component, where female students performed significantly better than their male counterparts (females: $M = 63.79$, $SD = 16.81$; males: $M = 49.24$, $SD = 27.25$; $p = .04$). Closer examination of the three sub-components of creativity identified the cause of this difference. Females ($M = 69.75$, $SD = 16.37$) achieved significantly higher scores for the sub-component *adaptable* than males ($M = 45.82$, $SD = 30.60$; $p = .002$).

For further inspection of the differences between the genders, the data set was split into those who found that ZD encourages creativity (37) and those who were undecided (4). Calculations were continued with $n = 37$. The significant differences described strengthened for this sample (see Table 1 for descriptive statistics). Further differences emerged for the importance of creativity for the current employer (females: $M = 3.52$, $SD = 1.08$; males: $M = 2.71$, $SD = 0.91$; $p = .02$). The significant differences also increased for the WF creativity component, with *open to experience* being the only sub-component without notable differences between genders (see Table 2).

Table 1. Descriptive statistics for split sample ($n = 37$).

		N	Mean	SD	Min	Max
How creative are you compared to your private sphere?	Female	23	4.17	.650	3	5
	Male	14	3.57	1.016	2	5
	Total	37	3.95	.848	2	5
How important is creativity for your current job?	Female	23	3.52	1.082	2	5
	Male	14	2.71	.914	1	4
	Total	37	3.22	1.084	1	5
How important is creativity for your current employer?	Female	23	3.96	1.224	1	5
	Male	14	2.64	1.216	1	5
	Total	37	3.46	1.366	1	5
Creativity (Wingfinder)	Female	23	62.91	16.61	36	94
	Male	14	43.29	25.566	7	84
	Total	37	55.49	22.31	7	94
Adaptable (Wingfinder)	Female	23	70.00	16.687	34	99
	Male	14	40.21	29.689	5	92
	Total	37	58.73	26.513	5	99
Innovative (Wingfinder)	Female	23	61.96	20.851	17	98
	Male	14	43.00	32.824	1	96
	Total	37	54.78	27.233	1	98

Table 2. Significant differences between male and female participants for split sample ($n = 37$).

One-way ANOVA		Sum of Squares	df	Mean Square	F	Sig.
How creative are you compared to your private sphere?	Between Groups	3.159	1	3.159	4.864	.034
	Within Groups	22.733	35	.650		
	Total	25.892	36			
How important is creativity for your current job?	Between Groups	15.018	1	15.018	10.075	.003
	Within Groups	52.171	35	1.491		
	Total	67.189	36			
How important is creativity for your current employer?	Between Groups	5.674	1	5.674	5.427	.026
	Within Groups	36.596	35	1.046		
	Total	42.270	36			
Creativity (Wingfinder)	Between Groups	3352.560	1	3352.560	8.055	.008
	Within Groups	14566.683	35	416.191		
	Total	17919.243	36			
Adaptable (Wingfinder)	Between Groups	7720.940	1	7720.940	15.368	.000
	Within Groups	17584.357	35	502.410		
	Total	25305.297	36			
Innovative (Wingfinder)	Between Groups	3127.314	1	3127.314	4.644	.038
	Within Groups	23570.957	35	673.456		
	Total	26698.270	36			

Further statistically significant differences between groups as determined by one-way ANOVAs were detected between students currently studying in semesters 1–4 (31) and those above (10) with regards to creativity ($F(10, 30) = 2.41, p = .03$). Students in higher semesters are more creative (semesters 1–4: $M = 3.29, SD = 0.81$; higher semesters: $M = 4.00, SD = 0.87$).

The Spearman’s rank order correlation coefficient (i.e., Spearman’s rho) was performed to identify relationships between variables. The Spearman’s rho revealed a statistically significant positive relationship between the participants’ self-rated creativity and the WF creativity score ($rs(41) = .38, p = .014$). Closer inspection of the relationships of the participants’ self-rated creativity with the creativity sub-components showed a low significant relationship for *innovative* ($rs(41) = .31, p = .05$) and a highly significant relationship for *open to experience* ($rs(41) = .46, p = .003$). Additionally, positive relationships were identified for the effect of the ZD Master’s program on the participants’ creativity and participants’ creativity compared to their private sphere ($rs(41) = .38, p = .016$).

5 Discussion

Overall, the findings showed that the higher students rated their creativity (subjective creativity), the higher their score for the WF creativity component (objective creativity). This confirms a direct link between subjective and objective creativity. The study also produced promising results for the Master's program ZukunftsDesign. Descriptive statistics established the students' positive attitude towards the program with regards to creativity. Only a small number of students were unsure whether the program promoted their creativity. A possible reason for this could be the professional background of those students. If they worked in creative jobs or had significant creative education before starting ZD, they may already hold a high level of creativity. Since this was not enquired as part of this study, this hypothesis remains to be tested. Future studies will include questions regarding the educational and professional background of the students to determine their level of creativity before commencing ZD.

One result that confirms the development of subjective creativity throughout the course of ZD is that students in higher semesters find themselves more creative compared to their fellow students in contrast to students in the first four semesters. This is an indication for an increase in perceived self-creativity throughout the Master's program and confirms the effectiveness of the creative learnings. Additionally, students who felt that ZD has a positive effect on their creativity also found themselves to be more creative compared to their private sphere. This provides further evidence for the individual creative development and learnings that are part of the Master's program.

Additional findings indicated that women tend to hold jobs where creativity is more important and they also achieved higher scores for the WF creativity component compared to men. However, when self-rating their creativity, there were no significant gender differences. This suggests that even though the objective creativity of women is significantly higher, they underestimate their subjective creativity while men overestimate the latter. The literature expresses caution when it comes to gender differences for creativity, as the field is very complex and the influencing factors are multiple [28]. Possible factors include barriers to promotion and career advancement, different domains, socialization, roles, and context (e.g., early childhood environments such as family, school, community, and college experiences) [29]. "Relative equality" between genders is assumed [28, 30]. However, according to a meta-analysis, there is a modest tendency for the female gender to score higher in creativity, particularly in *open to experience*, *fluidity*, *cognitive flexibility/adaptation*, and *divergent thinking* [28]. From the 67 studies included in this analysis, 30 did not find any statistically significant differences between the genders. Eight studies found higher creativity for females and four for males. Thirty studies showed no difference between genders on absolute scores but did reveal variations in their patterns. This trend also fits with the results of the current study, where female students performed significantly better than their male counterparts in the objective creativity assessment but similar gender differences could not be identified for all questions relating to creativity. Further research is required to explore this topic more deeply and include background information such as socialization and context.

5.1 Limitations

Although this study was only introduced as a pilot-study some limitations have to be noted. Due to the short time frame to collect data and a naturally limited pool of participants the sample size was comparatively small. Future research should allow more time for data collection and also include students outside of ZD to enable detailed comparative analysis with a random student sample. This will help to manifest the identified trends and provide opportunities for further practical and theoretical development.

Pairing the study with the WF also represented limitations as this naturally increased the length of the survey, while only the WF creativity component was used for the subsequent analysis. Despite the aforementioned advantages of image-based tests, questions and possible answers are limited to those that can be represented visually. Some images may not suit the respondents, so that the participants choose any arbitrary option and, thus, distort the result. Further, several questions of the WF were not relevant in times of a global pandemic due to the external constraints.

6 Conclusion

Findings of this pilot-study indicated that the Master's program ZukunftsDesign has a positive effect on students' individual creativity and does indeed promote creative talents. More in-depth research is required to manifest the identified trends and provide further practical and theoretical implications, which are important for the Master's program itself but also for any other similar degree. Further, results will indicate whether adaptations to the program may help to facilitate and improve the individual creativity of students. Overall, this pilot-study provides a baseline for future accompanying research and longitudinal comparative studies to examine the development of creativity within the educational landscape.

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