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Conceptual change when growing up: frameset for role models?

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ABSTRACT

Conceptions about adulthood have changed radically over the last century, while teaching in principle remained unchanged. The resulting gap has created a divergence between educational focus and adolescents' needs. In the present study, students' ($N = 243$, $M_{\text{age}} = 12.98$) conceptions about both childhood and adulthood were examined by using categorization and cluster analysis. A treatment group participated in a workshop, designed to promote emotional and cognitive maturation, while a control group only completed the pre-post-test. The analysis shows that students attach little importance to roles, and focus instead on obtaining character traits. Cluster analysis shows a tendency for boys to feel socially insecure, while girls seem to be more autonomous. The treatment group shifted ideas: holding on to childhood became less attractive. The stigmatic perception of adulthood was mitigated by positive traits. The categorization has proven as a tool to gain insight into cognitive maturity. Educational consequences are discussed.

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Adolescence; conceptual change; transition to adulthood; conceptions; categorization; character traits; role models

Introduction

Originally 'adolescence' was understood as a relatively short and well-structured phase of personality development that consisted of five core transitions: leaving home, leaving school, entering the workforce, marriage and parenting (Settersten & Ray, 2010). It was common for adolescents to enter into a permanent employment relationship as early as the late teens and to start a family by the early twenties. In the meantime, this transitional period towards adulthood has been extremely prolonged in the US and Europe (Côté, 2010). A society with a long life expectancy can afford to offer its members a long childhood and a greater variety of lifestyles than half a century ago (Pearce, Hayward, Chassin, & Curran, 2018). The maturity age varies from individual to individual, depending on biological heritage as well as cultural and social environment in which one grows up (Featherman & Lerner, 1985).

The definitions of childhood and adulthood

Definitions of childhood and adulthood derive from different scientific perspectives: Psychology considers demarcation aspects of cognition (Orr, Brack, & Ingersoll, 1988), emotion (Rosenblum & Lewis, 2006) and behavior (Adams & Berzonsky, 2006). The predictors of maturity originate in anthropological studies of non-western cultures (e.g. Schlegel & Barry, 1991), the validity of which can be assumed for preindustrial societies describing transition to adulthood through a process of role-shifting: These roles in postindustrial societies were impugned, ambiguous, outmoded, or even obsolete (Arnett, 1994). Consequently, milestones and traditional frames of reference on the way to becoming adults are absent or inadequate. In the postindustrial society, the concept of

benchmarks of 'adulthood' has changed fundamentally (Arnett & Taber, 1994), but this has neither been recognized nor respected in the field of education. Policies and institutions serving young adults half a century ago no longer meet today's needs because they do not reflect the realities of today's world realities (Settersten, 2007, 2008). As a result, a gap between the needs of young people on the one hand and institutional support on the other caused lacking adequate support during transitional periods. According to the theory of conceptual change, both the trainer (i.e. teacher or parent) and the student need to be aware of the subconscious ideas so far in order to support the process of growing up. Educational concepts based solely on scientific definitions may lead to pedagogical leaving students' pedagogical needs by the wayside. Internal concepts determine behavior: sixth-grade students without friends perceived their school environments as more threatening, which may finally result in school failure (Lessard & Juvonen, 2018). Likewise, the perception of being threatened predates friendlessness (Lessard & Juvonen, 2018), creating a vicious circle that may end in a grave social problem.

Starwalker-project – escorting the transition of adolescents to adulthood

A maturation process requires adolescents' cognition to operate at peak efficiency (Orr et al., 1988), in order to maximize learning capacities and to handle the interrelationships among disparate elements in their lives. The more complex cognitive processes influence parent-child relationships, sense of self, moral judgements, personality characteristics, defence mechanisms, behavioural maturity, planning for future education, and vocation goals (Orr et al., 1988). Intellectual development is regarded as an ongoing biological process of assimilation and accommodation (Ormrod, 2012) to aim for a better adaptation to environments (Piaget, 1977). It needs stimuli from an environment to activate processes. Growing up is, therefore, a process that does not happen incidentally, and need support. Presently, in most public institutions, the support given to foster the growth of these processes is lacking. This could hamper the cognitive and emotional maturation, and result in many of the familiar problems of immature young adults visible in the present generation (Settersten, 2007, 2008).

Considerable evidence shows that aspirations and plans of young people have a significant impact on their transition to adulthood. Even though many plans depend on parents' expectations and the socioeconomic resources of the family (Hogan & Kitagawa, 1985), it is the adolescents' perceptions and anticipations that influence subsequent behaviours. For example, educational aspirations have a major impact on the educational achievements of adolescents after graduation (Hogan & Kitagawa, 1985). Educational aspirations and marriage plans are consistently related, with a later age at marriage associated with higher educational aspirations (Bayer, 1969). These anticipations, developed in adolescence, appear to influence subsequent behaviours.

According to Piaget (1977), cognitive development supposedly is a reorganisation of mental processes resulting from biological maturation and environmental experience. Concept development reflects the transition through certain stages of cognitive development and is influenced by the social environment, which may be just as helpful or obstructive. As a result, children need support to develop cognitive maturity, because it does not necessarily evolve with physical maturity. The identification of the origins of conceptual change has inspired the design of pedagogical interventions with the aim of promoting deeper understandings of challenging concepts (Carey, 2000).

Conceptual change is not a daring new learning method (Carey, 2000), it is rather understood as a natural process of development and, thus, a daily experience of self-updating. Whenever a conflict arises between an existing concept and new experiences, this might trigger the updating of various concepts may be triggered. An educational environment following the theory of conceptual change ought to be expected to experience produce improved results when supporting students' transitions to (cognitive) maturity (Conradty & Bogner, 2016; Franke & Bogner, 2013; Fröhlich, Sellmann, & Bogner, 2013; Lucktong, Salisbury, & Chamratrithirong, 2017).

This study focuses (in particular) on the expectations of 'Generation Z' (Scholz, 2014) and their experiences in the transition to adulthood. On the basis of these concepts, an effective training was developed to change students' conception to the better. The objectives of the present study were threefold: 1) the extraction and analysis of an appropriate categorisation frameset, to gain insight into the adolescent perceptual world; 2) the measurement of conceptual changes after a one-year awareness training developed on the basis of the previously collected student conceptions; and 3) the extraction of students' profiles by cluster analysis of collected their conceptions.

Methodology and procedure

Participants

Nine classes from three classes in secondary modern schools, and six classes at secondary technical schools ($N_{\text{Total}} = 243$) participated. Half of our sample participated in an awareness training workshop ($N_{\text{Treatment}} = 114$), the other half acted as control (without training) ($N_{\text{Control}} = 129$). The gender distribution of the total sample was roughly balanced (42.8% female). The mean age of the total students sample was $M_{\text{age}} = 12.98$, $SD_{\text{age}} = 0.845$.

Test design

Students were observed by means of a pre-test (T0) at the beginning of the school year and a post-test (T1) about eight months later, after they had participated in weekly awareness training. Sociodemographic data were accompanied by two open questions, 'What does adulthood mean to me?' and second 'What does childhood mean to me?'. Questionnaire completion required about 15 minutes each time. As the participants were encouraged to record rapid notes and key phrases without consideration of language and grammar in about ten minutes, the answers were short and quite distinct.

Starwalker project awareness training

Awareness training was developed based on the concepts identified during the survey. A person's future-oriented and value-oriented lifestyle requires a high degree of cognitive maturity (Ingersoll, Orr, Herrold, & Golden, 1986). In order to make the transition into adulthood, it is enormously important for the younger generation to develop a positive idea of what it means to be an adult. It has been shown in health care that adolescents are able to develop physiological or psycho-physiological concepts about health, illness and healing before formal operational and abstract thinking emerges (Bibace & Walsh, 1980). Without this cognitive maturity, it is impossible to project one's life into the future. These future plans are often the decisive motivational factor, and can lead to a successful transition. Using the topics that the students considered to be particularly important, the awareness training was based on empathy, conflict management and communication (non-violent communication, (Rosenberg, 2016). To foster the processes of assimilation and accommodation (Ormrod, 2012) we offered students stimuli and opportunities to try out. In project work and panel discussions, students reviewed concepts for their usefulness. The students participated in the training weekly during regular lessons.

Data analysis procedure

For statistical analyses, IBM SPSS Statistics 24.0 was used.

Categorisation system

For a understanding of adolescents' perceptions we iteratively categorized the students' descriptions by following the method of inductive category development (Mayring, 2000), rather than

a deductive application of concepts. Longer answers had to be split as they were often combinations of various aspects: for example the answer ‘parents taking care of me’ is a composition of ‘parents’ and ‘being sheltered’ (Table 1).

The concepts should be developed inductively in order to capture the ideas of the young as authentically as possible. Therefore, the analysis was carried out as part of her master thesis by a student who was with no prior knowledge of the literature on transition and existing adulthood criteria and thus, not deductively inspired. In order to identify the themes, a semantic approach was applied: while developing the codes we tried to stay as close as possible to the semantic meaning of the content of the participants’ answers, in order to receive a detailed realistic summary of their responses (Braun & Clarke, 2006). The themes and findings were then interpreted in relation to the existing literature. The guiding question of the analysis was the students’ conceptions of the transition to adulthood.

We examined the data set for themes and grouped them into main themes. For mapping the categorisation frame set, we defined the main categories such that each topic maintained its semantic homogeneity, and was clearly distinguished from other topics. We subsequently found eleven categories (Table 2). Definitions and examples ensured a replicable code set. Finally, the objectivity of the data was valued in accordance with Cohen’s Kappa Coefficient. (Zöfel, 2002, p. 168).

Cluster analysis

An agglomerative hierarchical cluster analysis using Ward’s method extracted five distinct clusters. For determining cluster membership, K-means cluster analysis was applied to the data set, with the cluster number specified as five. We validated this analysis by a cross-tabulation of the two cluster solutions (coefficient of contingency = .764, $p < .001$).

Conceptual changes and gender differences

Nonparametric tests were applied due to the non-normal distribution of the variables (Shapiro-Wilk -tests; $p < .01$, Q-Q-plot analysis). Changes within the two test times were analysed using Wilcoxon’s Test. Mann-Whitney-U-tests were used for the evaluation of gender differences. Clusters were also analysed for both gender separately.

Results

Categorisation system

Table 2 displays examples of the main categories extracted. To test the category system, all sub-categories were re-sorted independently by subsequent intra-coding and inter-coding. The inter-rater reliability were almost perfect with Cohens Kappa = 0.887 ($N = 188$). The intra-rater reliability reveals a substantial agreement with Cohens Kappa = 0.934 ($N = 188$), which can be rated as ‘substantial’ to ‘almost perfect’ (Cohen, 1968; Wolf, 1997).

Table 1. Examples for coding of categories: contrasting juxtaposition of 1st, 2nd and external code.

answer	Coding of Categories		
	First coding	Intra-coding	Inter-coding
Homework	9	9	9
Sledging	4	4	4
Angel-Blue Ice Cream	0	11	11
Driving a car	11	1	11
Parents taking care *	3	3	3
Parents taking care *	2	2	2
Not being a child anymore	10	1	10

* example for splitting

Table 2. Categories about transition to adulthood with definitions and examples, translated from German.

Category	*	Definition	Example
E1 Responsibility	T	Responsibility per se; to take responsibility for oneself in word or in action, Independence	Taking on many tasks; 'must'; do it yourself; own plans; own flat; capability for self-service; taking care of siblings and family; leading a household
E2 Irresponsibility	T	No responsibility, Irresponsibility, Others have responsibility	Parents take care of me; non-participation in the household
E3 Behaviour & Manner	T	'Good manners', Ability to manage conflicts	Knowing how to behave; being friendly; Getting the message; Doing it properly; non-argumentativeness; non-annoyance; Not to hit someone immediately; settling disputes
E4 Misbehaviour	T	Misbehaviour, Naughtiness	To mess up; to goof up; to annoy so.; to tease others; to roister;
E5 Relaxation	T	Time spent for Relaxation, Fun and Play, Time spent away from obligations	Play; Fun; Laughter; Relaxation; Sandpit; Lego; Reading
E6 Core Family	R	Core family of birth; Parents, Siblings	Parents, family, siblings, uncle ... Pay attention! Parents take care of me → split in E6 and E2
E7 Secondary Family	R	Friends, Own family	Meeting friends; Boy/Girl-friend; Marrying; Finding spouse; Having kids; Pay attention! 'Playing with friends' → split in E7 and E5
E8 Career & Finances	T	Money and finance Occupation, Work, Job	Earning money; Spending money; Paying bills; Work; Having a job; Finding one's favourite job; Dream job
E9 Education	T	Learning in school and everyday situations	School; Homework; Learning; Learning for life; Learning how to (...); Preparing for adulthood
E10 Age	T	Chronological & legal age; Physical signs of age	18; Driver's license; To drive a car; Full Auxiliary Fire service; Body hair is growing; Voice changed;
E11 Consumption	T°	Age-typical consumption	Star Wars; Cinema; Handy; Computer games; Disco; Alcohol; smurf-blue ice-cream

* Classification of the Category as a Character Trait (T) or a Role Change (R)

° According to Arnett Consume is part of behaviour

While the first categorisation produced 188 themes, a second step grouped them into semantically homogeneous groups within and heterogeneous between the topics, resulting in 11 identifiable domains: Responsibility and Irresponsibility, Behaviour & Manners and Misbehaviour, Relaxation & Fun, Core Family, Secondary Family, Career & Finances, Education, Age and age-typical Consumption.

Adulthood and Childhood were described with the same nine concepts, but in a different composition (Figure 1). The respondents saw two pairs of concepts as applying only to children: the antonyms Misbehaviour/Behaviour and Irresponsibility/Responsibility). Because of the conceptual dichotomy between adulthood and childhood, the two sets of responses were treated as belonging together, and in describing the differences between adult and child, the questions served as distinct discriminators.

By focusing on students' perceptions, the concepts extracted were either assigned to the broader categories of role-changes (R) or character traits (T) (Table 2.). In the responses to perceptions of childhood, only 15% of the responses could be generalized to the category of role-changes, and the corresponding number of responses for perceptions of adulthood was even lower, at 11.4%. The vast majority of responses for both groups involved character traits.

Cluster analysis

The results were clustered to differentiate between various types of students, and to isolate both influential and irrelevant categories. The cluster analysis over the entire dataset allowed us to drop five categories as irrelevant: C03 Behaviour, C04 Misbehaviour, C06 Core Family, C09 Education and C10 Age. A closer examination of the subgroups of boys and girls showed that only three categories were irrelevant to all of them: C04 Misbehavior, C09 Education and C10 Age. In the analysis incorporating the data set for both genders, four categories were dropped due to irrelevance. The category 'C06 Core Family' was important to both genders individually, but was

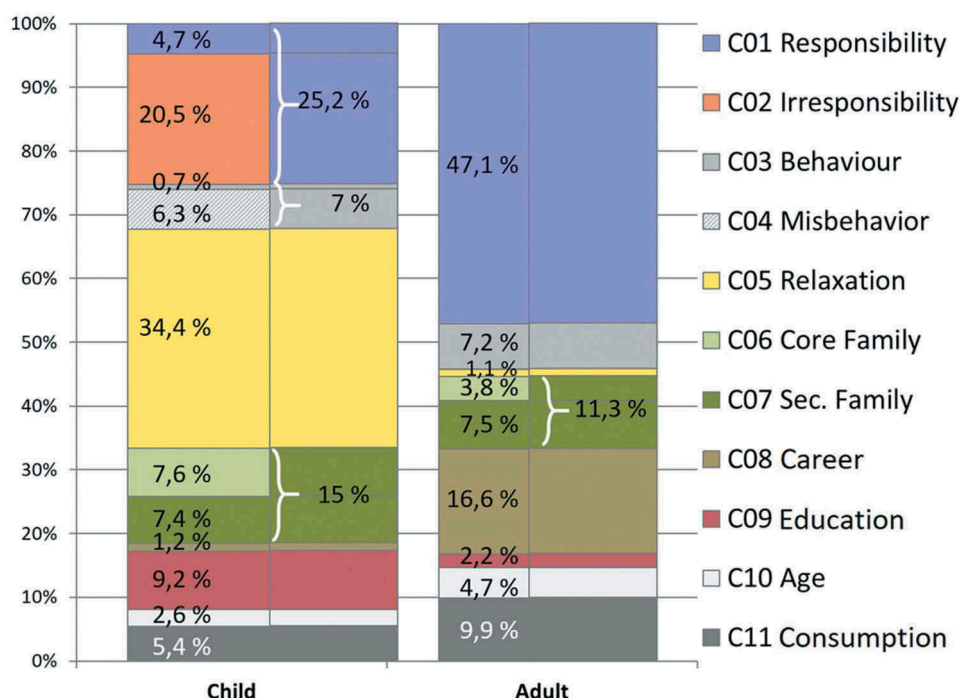


Figure 1. Conceptions composition about childhood and adulthood (pre-test) with percentages and compacting of the concepts of C01/02 Ir-/Responsibility, C03/04 Mis-/Behaviour, and C06/07 Family.

dropped in the collective sample. For this reason, the compacting of the Concepts C01/02, C03/04 and C06/07 was excluded.

The clusters were named after the defining categories (Figure 2): 'Irresponsible', 'Responsible'; the third cluster is named 'Family-Businessman' as a composite index with 'Responsibility' assuming four-sixths, 'Secondary Family' one-sixth, and 'Career & Finances' one-sixths of the total weighting; the fourth is labelled 'Materialist', consisting of 'Responsibility', 'Career & Finances' and 'Consumption' in equal prominence; the fifth is labelled 'Party People' as responses in the categories of 'Fun' and 'Friends' stand in prominence among this sub-set.

As the survey was conducted with both genders ($N = 243$, $N_{\text{boys}} = 139$ and $N_{\text{girls}} = 106$; Mann-Whitney-U-tests for cluster number of the case: $p = .007$; Mann-Whitney-U-tests for distance of the case from its classification cluster centre: $p = .001$), clusters were calculated for both genders separately. The clusters for each gender separately produce results significantly different from those of the complete sample. The clusters 'Party People', 'Responsibles' and 'Materialist' existed for both genders. For girls the clusters 'Family-Businessman' and 'Materialist' composed one cluster, whereas boys concatenated the clusters of 'Finances' and 'Responsibility'. For the boys, the cluster 'Family-Businessman' lacked sufficient emphasis on family to be considered a coherent cluster. In addition, each gender yielded a cluster unique to itself. Boys had a 'Social Desirability' cluster with 'Responsibility', 'Behaviour', 'Core' and 'Secondary Family' and 'Consumption', whereas the corresponding results for girls yielded 'Children' to cluster with 'No Responsibility', 'Fun' and 'Core Family'.

Although certain categories emerged as irrelevant for clustering within the entire data set, retaining them acquires renewed importance when conducting gender-specific analyses. For girls' clusters, four categories were found to be irrelevant: C03 Behaviour, C04 Misbehaviour, C09 Education and C10 Age. The boys' clusters did not include C02 'Irresponsibility' and C03 'Behaviour' as factors. Taking the complete sample, C01 'Responsibility' was important with its

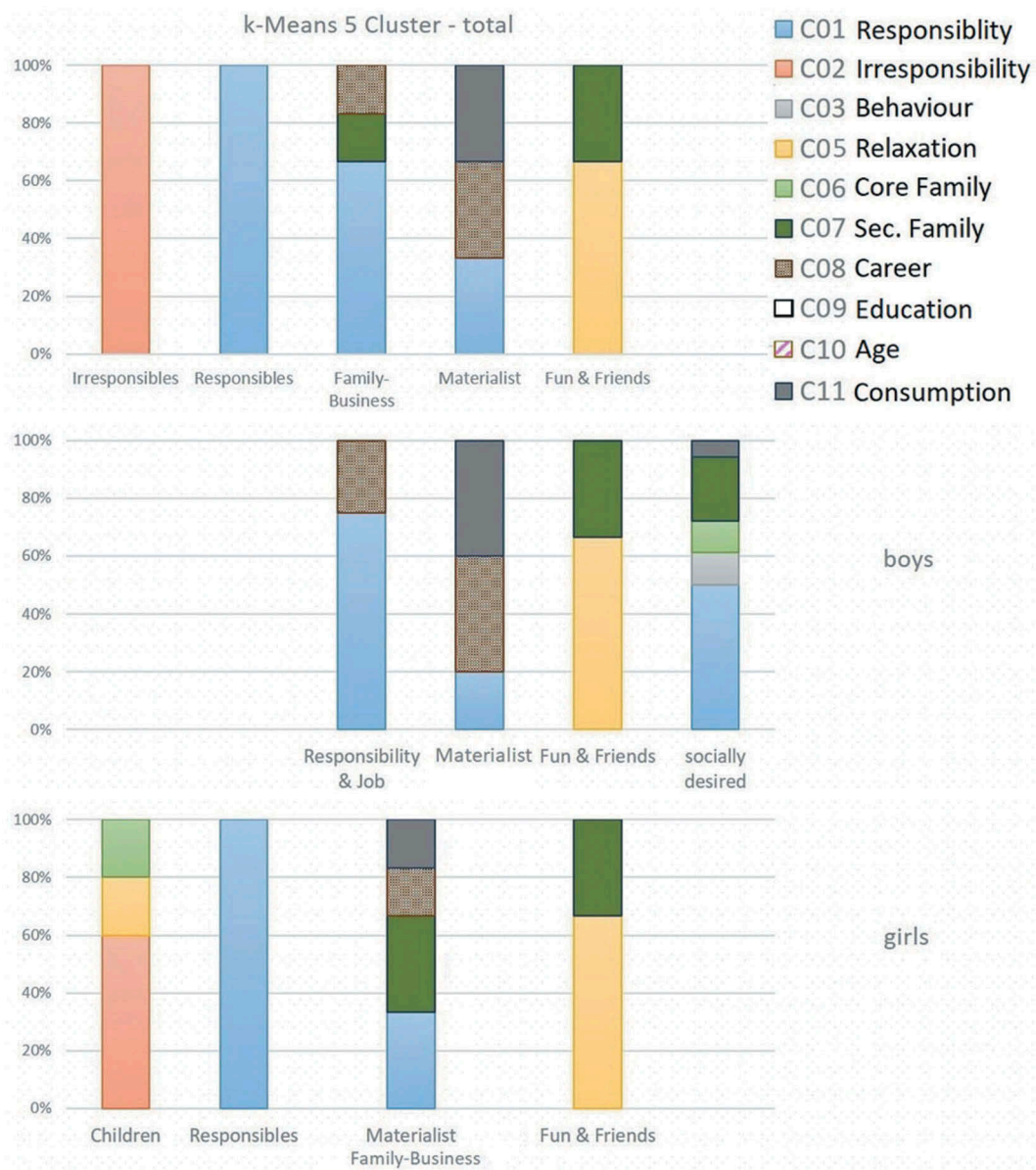


Figure 2. Pre-test k-means cluster analysis with five clusters.

own cluster. The category C06 'Core Family' on the other hand, relevant for the girls, vanished when applied to the entire data set. The cluster analysis as a whole demonstrated that five categories were irrelevant for the formation of clusters: C03 'Behaviour', C04 'Misbehaviour', C06 'Core Family', C09 'Education', and C10 'Age'.

Conceptual change

Although Childhood and Adulthood as topics were never directly raised during the intervention, participating students exhibited conceptual change. In contrast, in the control group, no such change was observed. In the post-test survey, Childhood was identified in 29.9% of responses with

Ir/Responsibility, 31.8% with Mis/Behavior and 18.8% with Education. Thus, the ratings of C01/02 'Ir/Responsibility' changed little, (25.2%), but C05 'Relaxation' almost completely vanished (pre-test 34.4% to post-test 2.2%). Instead, post-test surveys of the treatment group indicated a marked increase of C03/04 'Mis/Behavior' (7%) and C09 'Education' (9.2%) as concepts associated with Childhood. In the post-test survey, Adulthood was defined by 49.5 % as being associated with Responsibility, by 20.2% as being associated with Career and Finances, and – amazingly – 'Fun and Relaxation' increased to 8.4%. This latter category was the most frequent response as a conception of Childhood in the pre-test surveys, but almost vanished in the post-test. The importance of the concepts 'Mis/Behavior' and 'Consume' also declined.

The conceptual change effected was significant in the workshop group (Wilcoxon $Z = 3.110$, $p = .002$, Figure 3), but no statistically significant change was observed for the control group in the same period (Wilcoxon $Z = -.580$, $p = .562$).

The cluster analysis of the post-test conceptions showed that adolescents had strongly focalised their conceptions (Figure 4). The clusters themselves were named using the dominant concepts contained within them. Role models and consumption have no meaning anymore, but age and learning have been added. Noteworthy in the post-test results is the new fourth cluster of girls composed of 'Relaxation', 'Education' and 'Age' (Figure 4, girls). This new cluster practically fits the definition of 'student' in so far that it focuses on age-appropriate play and learning.

Discussion

When thirteen-year olds were asked about their ideas about being adults and being children, their responses yielded eleven categories. The concepts found are in line with the recent literature conducted in the Western World (Arnett, 2001; Vosylis, Kaniušonytė, & Raizienė, 2015). Compared with the results recorded by Arnett (2001), the major exception was the dropping of 'Emotional Maturity' as a relevant response in our research. However, given the different physical and chronological maturity, our respondents yet view on the establishment of own families obviously as not appropriate. Our participants attached great importance to having their own families, whereas this factor was unimportant in Arnett's (2001) study; additionally, in Arnett's group, the respondents regarded themselves as almost physically mature, but still far from able to start own families or to consider themselves adults. Similar to Arnett's study, frequently mentioned factors were having one's own household, financial and mental independence, and bearing responsibility for one's own choices.

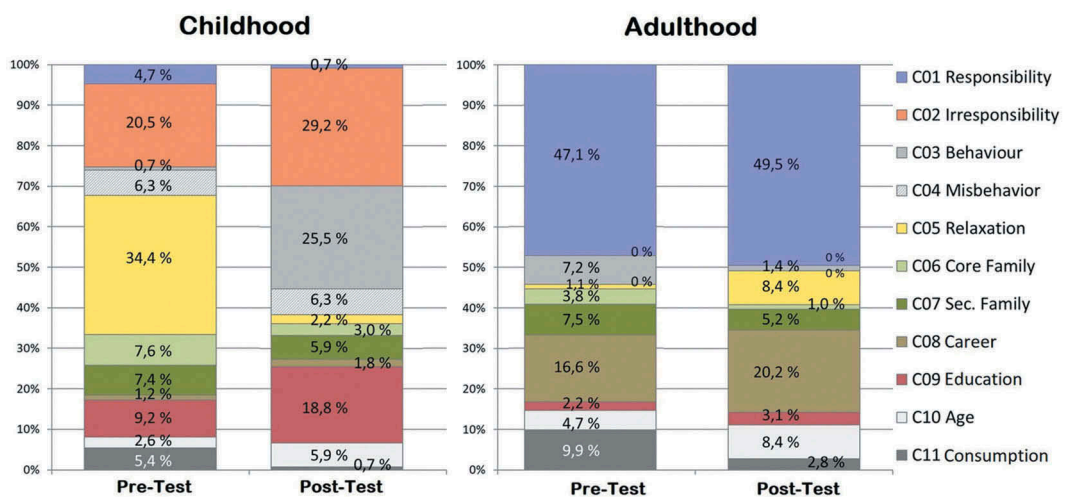


Figure 3. Changes in the composition of the conceptions about childhood and adulthood in percentage for pre- and post-test.

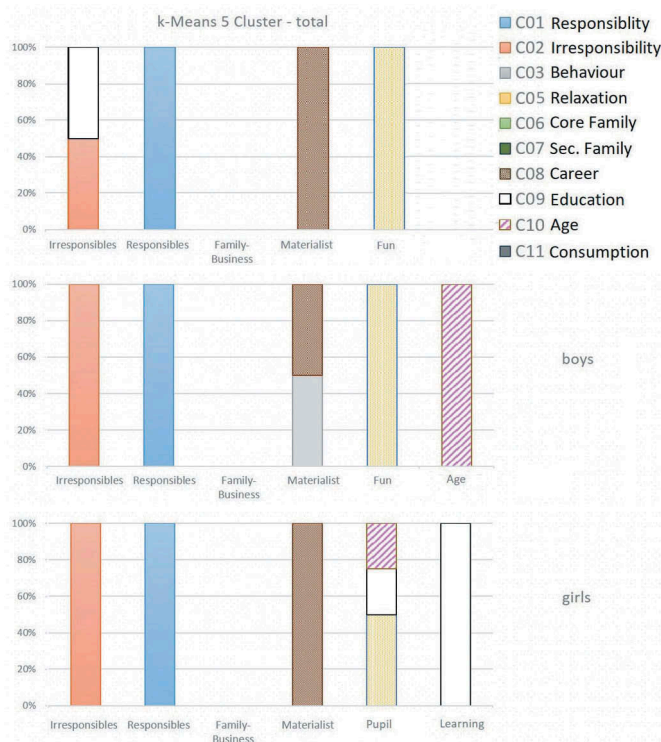


Figure 4. Post-test k-means cluster analysis with five clusters.

Among the most striking aspects is the cultural change observable when our recent attitudes were compared to those for instance earlier in the 1970s (Bayer, 1969): Role models are barely registered by the modern generation. About 85% of the conceptions in our study concerned the acquisition of (character) traits. Only about 15% were recognised as conceptions about Role-Changes. Our students did not consider marriage or parenthood as important milestones or markers of maturity (Arnett <20%, present study 11–15%), criteria considered crucial by most sociologists. Our students were also about 10 years younger than those in Arnett's study. Finally, for our present cohort, the completion of education and romantic partnership were regarded as the most important markers of having reached adulthood. As many university students, having reached these milestones, still do not perceive themselves as adults, it is evident that these milestones became irrelevant over time. As it became generally accepted that one could become pregnant without high school graduation or marriage, both role-assumption and biological maturity ceased to be perceived as relevant factors for one's personal maturation. Students put much more value on independence from their parents, most specifically their assertions of independence in finances and accommodation (Arnett, 2001).

In line with Arnett's findings, our younger students assigned high importance to the ability to take responsibility for one's own actions. Although maturity is a goal to be striven for, many teenagers (especially male ones) are shown to also enjoy the freedom of a 'jester's licence' in which they are free to engage in pranks and play. This was especially so in the pre-test surveys. Even Arnett (2001) found that young adults feel uncertain about their own maturity status, as they generally do not accept themselves as fulfilling their own most important criteria of what it meant to be mature (in particular 'taking responsibility for the consequences of their own actions' or 'deciding on faith and values independently of parents or other influences'; Arnett, 2001). It is noteworthy that the ideas of adolescents about childhood and adulthood are rather vague and unstructured in the pre-tests. If childhood is full of uncomfortable, restricting concepts, but the responsibility attributed to adults does not seem desirable, this could be

perceived as a vacuum by teenagers, in which they are uncertain, undefined and disoriented. This uncertainty and aimlessness could be involved in current social problems such as rising youth unemployment.

There are significant differences between boys and girls, resulting in different types of clusters. A closer look at the clusters could provide clues as to what adolescent boys and girls experience emotionally on their way to adulthood. Girls at the age of thirteen may already have more stable aspirations and expectations of adulthood than boys. Girls exhibit a greater attachment to family, and are more aware of the problems of reconciling work and family life, which is reflected in the cluster 'Family Business'. This is a composition of 'Career' and 'Family', adding 'Materialism' as a related factor. Boys, on the other hand, seem to have vague ideas of adulthood at this age and are more dependent on social orientation possibilities: only boys form the cluster 'social desirability'. These results are in line with other studies on the same phenomenon: When modern young people assume more responsibility, this does not seem to be due to the imitation of role models, but is intrinsically motivated by a yearning for personal independence, responsibility, and maturity (Berngruber, 2016). Remarkably, women, despite their earlier independence, remain more emotionally connected to their families when growing up than young men (Berngruber, 2016).

With the emergence of gender equality movements since the 1960s, and due to general socioeconomic changes, there are important differences in how young people today define – and achieve – adulthood compared to previous generations (Kabeer, 2010). Whereas in the 1950s and 1960s in the USA men married, but 'women got married' ([sic!] passive form in Settersten & Ray, 2010), young people today do not focus on these discrete roles to define adulthood. In the meantime, in Germany young women see themselves independent of any social status they gain with marriage (Berngruber, 2016). In summary, although there are still considerable differences between the genders regarding care and family, boys and girls in Europe today seem to be growing up with new or even hardly any role models. This might be culture-dependent, as Adachi (2018) found traditional role models for Japan.

An awareness training program was developed by incorporating students' ideas following the theories of Rosenberg (2016) and Ormrod (2012). It cultivated cognitive abilities, debating issues around empathy and conflict resolution. In the process, the students played out thought experiments in which they were asked to examine the consequences of various options for their future. The aim of these exercises was to encourage students' appetite for future planning and to promote cognitive and emotional maturity (Bibace & Walsh, 1980). As a result of awareness training, adolescents gained greater appreciation of adulthood. Childhood became less attractive, and playing the fool was no longer so desirable. On the contrary, the stereotype of adult life as exhausting, boring and serious developed into a more nuanced picture in which fun and relaxation became more prominent and freedoms came with responsibility. The children's indicators were fun and relaxing in the pre-test, but that did not exist after the post-Awareness training. Childhood was perceived as more differentiated. Fun and relaxation was not a unique feature of childhood, but adulthood was with fun, too. We interpret this result as a success of awareness training, which can be an effective intervention for cognitive maturation. The children were tempted to develop a more positive attitude to transition and to strive for a greater maturity. An 'eternal childhood' became less attractive.

Conclusions

A framework for monitoring adolescents' concepts about adulthood and childhood is essential to monitor changes over time. The categories selected were comparable to studies in other post-industrial countries (Arnett, 2001; Vosylis et al., 2015), and show that adolescents nowadays prefer the development of traits over of roles. In addition, the effectiveness of awareness training in supporting adolescents for a successful transition was measured with the conceptual framework. The positive results registered indicate that our approach was helpful to students in their life-transitions. The concepts developed for the better, with a more positive attitude towards adulthood, an increased focus on learning, and a declining appetite for

consumption being registered in the end. Teachers' feedback to the study shows that the targeted cohort improved with greater attention, improved social behaviour, reduced application of disciplinary measures, and above-average academic achievement, although these reports can only be taken as anecdotal evidence.

In summary, the groundwork laid by this and similar experiments designed to measure and modify adolescents' conceptual changes provide a promising starting point for further research into the interrelations of youth concepts, transition, academic motivation and cognitive maturation.

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Disclosure statement

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Franz X. Bogner (with a PhD in neurobiology, a Habilitation in Biology Education as well as a post-doctoral fellowship at the Cornell University, USA) is the Department head and full professor of the Institute of Biology Education as well as the director of the Z-MNU (Centre of Math & Science Education) at the University of Bayreuth. He and his research group are mainly involved in pre-service teacher education and in-service teacher enhancement. Prof. Bogner's research projects consistently included cognitive (and emotional and attitudinal) assessment. His citation impact factor is $h=36$, his best paper (Bogner 1998) is $>500x$ cited.

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References

- Adachi, T. (2018). Work–family planning and gender role attitudes among youth. *International Journal of Adolescence and Youth*, 23(1), 52–60. doi:10.1080/02673843.2016.1269655
- Adams, G. R., & Berzonsky, M. D. (Eds.). (2006). *Blackwell handbook of adolescence*. Oxford, UK: Blackwell Publishing Ltd.
- Arnett, J. J. (1994). Are college students adults? Their conceptions of the transition to adulthood. *Journal of Adult Development*, 1(4), 213–224.

- Arnett, J. J. (2001). Emerging adulthood: The theory of development from the late teens through the twenties. *Journal of Adult Development*, 8(2), 133–143.
- Arnett, J. J., & Taber, S. (1994). Adolescence terminable and interminable: When does adolescence end? *Journal of Youth and Adolescence*, 23(5), 517–537.
- Bayer, A. E. (1969). Life plans and marriage age: An application of path analysis. *Journal of Marriage and Family*, 31(3), 551–558.
- Berngruber, A. (2016). Leaving the parental home as a transition marker to adulthood. In A. Furlong (Ed.), *Routledge international handbooks. Routledge handbook of youth and young adulthood* (pp. 193–198). London: Routledge.
- Bibace, R., & Walsh, M. E. (1980). Development of children's concepts of illness. *Pediatrics*, 66(6), 912–917.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Carey, S. (2000). Science education as conceptual change. *Journal of Applied Developmental Psychology*, 21(1), 13–19.
- Cohen, J. (1968). Weighted kappa: Nominal scale agreement provision for scaled disagreement or partial credit. *Psychological Bulletin*, 70(4), 213–220.
- Conradty, C., & Bogner, F. (2016). Hypertext or Textbook: Effects on motivation and gain in knowledge. *Education Sciences*, 6, (3). doi:10.3390/educsci6030029
- Côté, J. E. (2010). *Arrested adulthood: The changing nature of maturity and identity*. New York, NY: New York University Press. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=48485>
- Featherman, D. L., & Lerner, R. M. (1985). Ontogenesis and sociogenesis: Problematics for theory and research about development and socialization across the lifespan. *American Sociological Review*, 50(5), 659.
- Franke, G., & Bogner, F. X. (2013). How does integrating alternative conceptions into lessons influence pupils' situational emotions and learning achievement? *Journal of Biological Education*, 47(1), 1–11.
- Fröhlich, G., Sellmann, D., & Bogner, F. X. (2013). The influence of situational emotions on the intention for sustainable consumer behaviour in a student-centred intervention. *Environmental Education Research*, 19(6), 747–764.
- Hogan, D. P., & Kitagawa, E. M. (1985). The impact of social status, family structure, and neighborhood on the fertility of black adolescents. *American Journal of Sociology*, 90(4), 825–855.
- Ingersoll, G. M., Orr, D. P., Herrold, A. J., & Golden, M. P. (1986). Cognitive maturity and self-management among adolescents with insulin-dependent diabetes mellitus. *The Journal of Pediatrics*, 108(4), 620–623.
- Kabeer, N. (2010). Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gender & Development*, 13(1), 13–24.
- Lessard, L. M., & Juvonen, J. (2018). Friendless adolescents: Do perceptions of social threat account for their internalizing difficulties and continued friendlessness? *Journal of Research on Adolescence: the Official Journal of the Society for Research on Adolescence*, 28(2), 277–283.
- Lucktong, A., Salisbury, T. T., & Chamrathirong, A. (2017). The impact of parental, peer and school attachment on the psychological well-being of early adolescents in Thailand. *International Journal of Adolescence and Youth*, 23(2), 235–249.
- Mayring, P. (2000). Qualitative content analysis. *Forum Qualitative Social Research*, 1, 1–20.
- Ormrod, J. E. (2012). *Essentials of educational psychology: Big ideas to guide effective teaching* (3rd ed.). Boston: Allyn & Bacon.
- Orr, D. P., Brack, C. J., & Ingersoll, G. (1988). Pubertal maturation and cognitive maturity in adolescents. *Journal of Adolescent Health Care: Official Publication of the Society for Adolescent Medicine*, 9(4), 273–279.
- Pearce, L. D., Hayward, G. M., Chassin, L., & Curran, P. J. (2018). The increasing diversity and complexity of family structures for adolescents. *Journal of Research on Adolescence: the Official Journal of the Society for Research on Adolescence*, 28(3), 591–608.
- Piaget, J. (1977). The role of action in the development of thinking. In W. F. Overton & J. M. Gallagher (Eds.), *Knowledge and development* (pp. 17–42). Boston, MA: Springer US. doi:10.1007/978-1-4684-2547-5_2
- Rosenberg, M. B. (2016). *Das Herz gesellschaftlicher Veränderung: Gewaltfreie Kommunikation: Die Ideen & ihre Anwendung. Wie Sie Ihre Welt entscheidend umgestalten können: (2. Auflage)*. Paderborn: Junfermann Verlag.
- Rosenblum, G. D., & Lewis, M. (2006). Emotional development in adolescence. In G. R. Adams & M. D. Berzonsky (Eds.), *Blackwell handbook of adolescence* (pp. 269–289). Oxford, UK: Blackwell Publishing Ltd. doi:10.1002/9780470756607.ch13
- Schlegel, A., & Barry, H., III. (1991). *Adolescence: An anthropological inquiry*. New York, NY: Free Press.
- Scholz, C. (2014). *Generation Z: Wie sie tickt, was sie verändert und warum sie uns alle ansteckt (eng. how the generation is ticking, what's changing it and why it's infecting us all)*. Weinheim: Wiley-VCH Verlag GmbH & Co. KGaA. Retrieved from <https://ebookcentral.proquest.com/lib/zbw/detail.action?docID=1834000>
- Settersten, R. A. (2007). Passages to adulthood: Linking demographic change and human development. *European Journal of Population/Revue Européenne De Démographie*, 23(3–4), 251–272.
- Settersten, R. A. (2008). Social policy and the transition to adulthood. In R. A. Settersten, F. F. Furstenberg, & R. G. Rumbaut (Eds.), *The John D. and Catherine T. MacArthur Foundation series on mental health and development research network on transitions to adulthood and public policy. On the frontier of adulthood: Theory, research, and public policy* (pp. 534–555). Chicago, Ill.: Univ. of Chicago Press.
- Settersten, R. A., & Ray, B. (2010). What's going on with young people today? The long and twisting path to adulthood. In *Future of children: Transition to adulthood* (Vol.20, no.1, pp. 19–41). Princeton, NJ: Princeton University Woodrow Wilson School of Public and International Affairs.

- Vosylis, R., Kaniušonytė, G., & Raiziene, S. (2015). What does it mean to be an adult? Perceptions of adulthood among lithuanian emerging adults. In R. Žukauskienė (Ed.), *Emerging adulthood in a European context* (pp. 54–78). New York, NY: Routledge.
- Wolf, R. M. (1997). Rating scales. In J. P. Keeves (Ed.), *Educational research, methodology and measurement:: An international handbook* (pp. 958–965). Oxford, UK: Elsevier.
- Zöfel, P. (2002) *Statistik verstehen. Ein Begleitbuch zur computerunterstützten Anwendung* [Understand Statistics. A companion book for computer-aided application]. München: Addison-Wesley.