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All aligned? Investigating Perceived Constructive Alignment as Predictor for Intrinsic Motivation

Abstract

Constructive Alignment (CA) is increasingly recognized for enhancing higher education teaching quality. However, its relationship with intrinsic motivation (IM) remains unclear. In a sample of 231 students, this study examined if students' perceived CA (pCA) could predict IM beyond the three basic needs outlined in Self-Determination Theory (SDT). Regression analyses showed that total pCA, clarity of intended learning outcomes, and teaching alignment predict IM beyond SDT needs. One-sided t-tests indicated pCA is perceived significantly higher in seminars than in lectures. These findings highlight the importance of implementing CA in higher education to support students' IM.

Keywords

constructive alignment, intrinsic motivation, self-determination theory, higher education

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Alles abgestimmt? Eine Untersuchung von wahrgenommenem Constructive Alignment als Prädiktor für die intrinsische Motivation

Zusammenfassung

Constructive Alignment (CA) gewinnt in der Hochschulbildung an Bedeutung, doch der Zusammenhang mit intrinsischer Motivation (IM) ist unklar. Diese Studie prüfte an 231 Studierenden, ob wahrgenommenes CA (wCA) die IM über die drei in der Selbstbestimmungstheorie (SBT) definierten Grundbedürfnisse hinaus vorhersagt. Regressionsanalysen zeigten, dass Gesamt-wCA, die Klarheit der Lernziele und die Abstimmung der Lehrmethoden die IM über die SBT-Bedürfnisse hinaus vorhersagen kann. Einseitige t-Tests ergaben, dass wCA in Seminaren signifikant höher wahrgenommen wird als in Vorlesungen. Die Ergebnisse unterstreichen die Bedeutung von CA für die Förderung der IM von Studierenden.

Schlüsselwörter

Constructive Alignment, intrinsische Motivation, Selbstbestimmungstheorie, Hochschullehre

1   Introduction

Over the last 20 years, especially since the Bologna reform, the requirements for university teaching have changed and teaching quality has become a quality feature of universities (Deibl et al., 2018). Important aspects of teaching quality are an outcome-based instructional design (Dias, 2017) and engaging students in deep learning approaches (Hailikari et al., 2022). An important didactic approach to developing teaching towards student-centered and outcome-based education is Constructive Alignment (CA). Because of its advantages, CA is already implemented in various higher education institutions for different subjects (Kalmpourtzis & Romero, 2020; Lasrado & Knaul, 2021; Morselli, 2018). Researchers found evidence for a positive relationship between students' deep learning approaches and motivation, as well as academic performance, and a positive relationship between motivation and academic performance (Cerasoli et al., 2016; Du, 2021; Everaert et al., 2017; Taylor et al., 2014). However, there is a research gap for studies investigating CA as a predictor of students' intrinsic motivation (IM). Therefore, we investigated if students' perceived CA (pCA) could predict IM beyond the three needs of the Self-Determination Theory (SDT) – competence, autonomy, and relatedness. Beyond that, it was explored whether students' perceptions of CA differed between lecture courses and seminars.

2   Theoretical and Empirical Background

2.1   Constructive Alignment

CA is an integrative teaching design that guides course development (Biggs & Tang, 2011; Wang et al., 2013), consisting of two key elements: the 'constructive' and 'alignment' components. The constructive aspect, based on constructivist learning theory, views learners as active agents in acquiring knowledge, either individually or in groups (Bada & Olusegun, 2015). Both views are essential for CA. The alignment component involves three elements: 1) Intended Learning Outcomes (ILOs),

2) Teaching-Learning Activities (TLAs), and 3) Assessment Tasks (ATs). ILOs describe the desired competence, knowledge, and qualifications students should achieve by the end of the course (Meyerhoff & Brühl, 2016). According to CA, TLAs and ATs must align with ILOs, which should be clearly defined. The TLA should address the activities in the ILOs, and the ATs should assess whether students meet the ILO criteria. Ensuring that ATs authentically represent the ILOs is vital, as students are sensitive to assessments (Struyven et al., 2005). Biggs and Tang (2011) argue that students' perceptions of assessment methods, rather than the ILOs themselves, greatly affect their learning. Formative feedback, aligned with ILOs and assessment criteria, is also essential for preparing students for ATs.2.2 Relationship between CA, Deep Learning Approach, and IM

According to Biggs and Tang (2011), learners who are opting for a surface approach aim to complete tasks with minimal effort while still fulfilling course expectations. On the contrary, learners choosing a deep learning approach intend to engage meaningfully with the content out of interest to understand can be considered intrinsically motivated. Deep learning approaches, which are encouraged by CA (Biggs & Tang, 2011; Hailikari et al., 2022; Leber et al., 2018; Wang et al., 2013), have a high relevance in an educational setting, as they are associated with higher academic performance compared to surface approaches (Everaert et al., 2017; Gamsızkan & Gonullu, 2022). In addition, Everaert et al. (2017) concluded that deep learning is more than just spending more time on engaging in learning content. Deep learning approaches are directly positively related to IM. However, only very few studies investigated the direct relationship between CA and IM. In the aligned condition, Leber et al. (2018) found higher ratings of self-competence, which is one of the three SDT needs. Roßnagel et al. (2021) examined the relationship between pCA and student motivation and perceived learning demands. Computing regression analyses, they found that pCA is a meaningful predictor for their motivation. Amongst other, ILO clarity was associated with increased perceptions of self-competence, greater enjoyment, heightened effort devoted to learning and higher evaluations of the course's usefulness.

2.2 Self-Determination Theory

SDT, a motivational theory, suggests that individuals are naturally inclined toward psychological growth, acquiring knowledge, and building relationships (Ryan & Deci, 2020). To support this, Ryan and Deci (2020) identified three fundamental psychological needs: competence, autonomy, and relatedness. Competence is the confidence in one's ability to succeed, autonomy refers to personal initiative and ownership of actions, and relatedness is the sense of belonging and connection to others. When these needs are met, a person is intrinsically motivated (IM), which involves interest, enjoyment, and satisfaction in an activity (Deci & Ryan, 1994; Ryan & Deci, 2020). IM is linked to positive long-term outcomes, making it the preferred form of motivation in education, compared to extrinsic motivation.2.4 Perception of CA in Lecture Courses and Seminars

The most common course formats for knowledge transfer in higher education are lectures and seminars (Klein et al., 2023). Lectures are often seen as passive, one-directional, and focused on large student groups (Biggs & Tang, 2011; Zeng et al., 2020). Seminars, on the other hand, involve closer interaction and more opportunities for feedback and idea sharing (Hensley & Oakley, 1998). It remains unclear whether pCA differ between these formats. However, Brunton et al. (2000) found that seminars can offer more effective learning and interaction. Alt (2017) reported a stronger perception of a constructivist learning environment in seminars. Hodgson et al. (2014) noted that lectures were seen as fostering scientific knowledge, while practical classes were seen as more valuable for skill development. Still, evidence suggests that lectures are becoming more interactive (Meguid & Collins, 2017). Therefore, the question of whether pCA varies between formats remains open.

2.3 The Current Study

This study adds to the body of literature on CA and motivation for at least three reasons. To the knowledge of the authors, the study of Roßnagel et al. (2021) is the only one that specifically looks into the relationship between different dimensions of pCA and student motivation. They gave valuable insights into this field, however,

their study has a few limitations, such as a relatively small sample size ($N = 59$), a homogenous sample, and inconsistency with motivational theories. Prior studies on CA have purposefully selected courses to investigate; while this provides insight into the impact of CA in specific courses, it is not broadly representative of different courses across subjects. Therefore, this study seeks to get an understanding of CA in a broad spectrum of subjects by investigating students from different subjects and courses. Moreover, this study aimed for a bigger sample to see if the results from Roßnagel et al. (2021) could be replicated.

This leads to the following research questions:

RQ1: How is pCA linked to IM?

RQ1a: To what extent can pCA predict IM?

RQ1b: To what extent can CA predict IM beyond the three psychological needs of SDT?

RQ2: Does students' pCA differ between lecture courses and seminars?

It is expected that students pCA differs between lectures and seminars, in the way that students perceive seminars as more constructively aligned.

3 Method

3.1 Sample

We collected data from a sample of $N = 231$ university students in Germany. Demographic characteristics of the sample are presented in Table 1.

Category	Subcategory	Count (*n*)	Percentage (%)
Major	Humanities and Social Sciences	175	76 %
	Natural Sciences, Technology, Engineering and Computer Science	45	19 %
	Medicine	7	3 %
	Law	3	2 %
Degree Pursued	Teaching	12	5 %
Education Level	Undergraduate	171	74 %
	Postgraduate	50	22 %
	State Examination	10	4 %
Age Range[a]	18 to 38 years ($M = 23.00$, $SD = 2.96$)		
Gender[b]	Male	56	24 %
	Female	170	74 %
	Non-binary	1	-

Note: [a] Semester range from 1 to 7+ (Median = 4); [b] 4 people did not indicate their gender.

Table 1: Descriptive Data of the Sample, Consisting of Students at German Universities (N = 231)

3.2   Measures

3.2.1 Perceived Constructive Alignment

For measuring pCA, the Constructive Alignment Questionnaire (CALEQ) was used (Fitzallen et al., 2017). This questionnaire consists of four subscales: *Clarity of ILO* (sample item: 'I had a clear idea of what I was supposed to learn'), *Teaching Alignment* (sample item: 'The teaching and learning activities addressed what was supposed to learn'), *Assessment Alignment* (sample item: 'It was explained clearly to me how the assessment tasks were related to what I was supposed to learn'), and *Feedback Effectiveness* (sample item: 'I received feedback that was clear and specific to what I was supposed to learn').

3.2.2 Motivation

Motivation was measured using the Intrinsic Motivation Inventory (Ryan, 1982). The following four subscales of this measurement were used: *Interest/Enjoyment* which is the subscale for IM (sample item: 'I would describe the activities on the course as very interesting'), *Perceived Competence* (sample item: 'I consider myself good at the course activities'), *Perceived Choice* which corresponds to SDT autonomy (sample item: 'I did the tasks for the course because I wanted to'), and *Relatedness* (sample item: 'I had the feeling that I could really trust the other course participants'). As IM is not only theoretically but also empirically associated with higher enjoyment and interest in activities (Deci & Ryan, 1994), this is the only subscale directly measuring IM. The other subscales were included because they cover SBT and thus provide strong theoretical support for the study and because these subscales correlate strongly with IM (Vasconcellos et al., 2020).

3.2.3 General Information

All items were rated on a five-Point Likert scale, except for the CALEQ subscale Assessment Alignment. Here, a sixth option was given not to provide any information in case they had not finished the assessment tasks yet. All items were translated into German and slightly adapted to the teaching-learning context in higher

education. The scales were piloted and slightly adapted to improve internal consistency. All subscales consist of four or five items. Response options ranged from 'strongly disagree', 'rather disagree', 'tend to agree' to 'fully agree'.

The following socio-demographic data was collected: Age, gender, study subject clustered in groups, type of degree, course type (lecture or seminar), and whether the evaluation for the course had already taken place.

3.3 Procedure

Participants, primarily from Heidelberg University, were recruited through email distribution lists from the Education Studies Student Council, advertisements in pedagogical psychology lectures and seminars, as well as flyers and social media. The online questionnaire was available from calendar weeks 5 to 10. The lecture-free period started in calendar week 9, meaning that students will most likely finish their assignments around that time. In the questionnaire, students were asked to refer to a course in their subject and to answer the entire questionnaire for this chosen course. Students were informed about the aim of the study in advance and agreed to the purpose of data collection. Participation was fully anonymous. Participants were compensated with student credits.

3.4 Analyses

For data analyses, the software 'R 4.3.1' was used. To answer research question 1a simple regression analyses were conducted, with IM as the dependent variable and pCA as a predictor. For research question 1b a series of stepwise multiple regression analyses were performed. For research question 2 one sided t-tests for independent variables were performed.

4 Results

4.1 Preliminary Analyses

Table 2 presents the arithmetic means, standard deviations, and correlations of the four pCA subscales and four dimensions of student motivation. Overall, the two constructs pCA and motivation correlate moderately to strongly with each other.

Variable	M	SD	1	2	3	4	5	6	7	Cronbachs α
1. ILO Clarity	3.79	0.82								.75
2. Teaching Alignment	3.70	0.73	.52**							.62
3. AT Alignment	3.93	0.79	.51**	.41**						.79
4. Feedback Effectiveness	3.09	1.15	.35**	.44**	.32**					.86
5. IM	3.84	0.96	.53**	.48**	.45**	.30**				.93
6. Perceived competence	3.72	0.75	.39**	.40**	.44**	.27**	.57**			.80
7. Perceived choice	3.00	0.99	.16*	.19**	.26**	.08	.39**	.23**		.80
8. Related-ness	3.73	0.84	.20**	.30**	.15	.22**	.28**	.32**	.05	.77

Note. * $p < .05$ ** $p < .01$.

Table 2: Means, Standard Deviations, Correlations of pCA and Different Dimensions of Student Motivation

4.2 RQ1a: To What Extent can CA Predict IM?

Results revealed that pCA could strongly predict IM ($ß = .57$, $R^2 = 0.35$, $F(1, 136) = 74.22$, $p < .01$). Furthermore, pCA was a significant predictor for each of the needs of the SDT: Perceived competence ($ß = .46$), perceived choice ($ß = .26$) and relatedness ($ß = .35$). Detailed analysis with the subscales of pCA as predictors of IM revealed that ILO clarity ($ß = .23$), as well as the teaching alignment ($ß = .19$), the assessment alignment ($ß = .19$) and feedback effectiveness ($ß = .13$) predict IM (see Table 3).

Multiple Regression Analysis

	Dependent Variable			
	Interest/Enjoy-ment	Perceived Compe-tence	Perceived Choice	Related-ness
	(1)	(2)	(3)	(4)
ILO Clarity	0.225	0.102	-0.016	0.146
	$p = .009$	$p = .290$	$p = .886$	$p = .176$
Teaching Alignment	0.190	0.177	0.097	0.177
	$p = .023$	$p = .059$	$p = .358$	$p = .089$
Assessment Alignment	0.193	0.289	0.214	-0.047
	$p = .015$	$p = .001$	$p = .032$	$p = .633$
Feedback Effectiveness	0.129	0.045	0.038	0.156
	$p = .078$	$p = .578$	$p = .681$	$p = .090$
Constant	0.078	0.130	-0.006	-0.058

Observations	138	138	138	138
R^2	0.366	0.251	0.079	0.134
Adjusted R^2	0.347	0.229	0.051	0.108
Residual Std. Error (df = 133)	0.769	0.861	0.972	0.964
F Value (df = 4; 133)	19.231 $p < .001$	11.170 $p < .001$	2.839 $p = .027$	5.160 $p < .001$

Note: All values are z-standardized. The presented p-values are two-sided.

Table 3: Results Multiple Regression Analysis with Subscales of pCA as Predictors of IM and SDT Needs

4.3 RQ1b: To What Extent can pCA Predict IM Beyond the Three SDT Needs?

As seen in Table 4, multiple regression analysis revealed that CA still significantly predicts IM, when controlling for the three needs of SDT ($\beta = .36$). The model explains 50 % of the variance related to IM. Looking into the dimensions of CA, also *ILO Clarity* ($\beta = .33$) and *Teaching Alignment* ($\beta = .15$) could predict IM over and beyond the three SDT needs. *Assessment Alignment* as well as *Feedback Effectiveness* failed to predict IM beyond the three SDT needs.

Stepwise Multiple Regression

Dependent Variable

	IM				
	(1)	(2)	(3)	(4)	(5)
Perceived Competence	0.300 $p < .001$	0.364 $p < .001$	0.339 $p < .001$	0.299 $p < .001$	0.298 $p < .001$
Perceived Choice	0.210 $p < .001$	0.249 $p < .001$	0.237 $p < .001$	0.218 $p < .001$	0.214 $p < .001$
Relatedness	0.042 $p = .501$	0.083 $p = .097$	0.058 $p = .245$	0.051 $p = 415$	0.037 $p = .554$
pCA	.362 $p < .001$				
ILO Clarity		0.328 $p < .001$	0.267 $p < .001$	0.207 $p = .008$	0.192 $p = .013$
Teaching Alignment				0.149 $p = .009$	0.145 $p = .046$	0.110 $p = .145$

Assessment Alignment				0.072 $p = .331$	0.063 $p = .391$
Feedback Effectiveness					0.102 $p = .122$
Constant	0.039	0.000	0.000	0.044	0.042
Observations	138	231	231	138	138
R^2	0.503	0.502	0.516	0.501	0.510
Adjusted R^2	0.488	0.493	0.506	0.478	0.484
Residual Std. Error	0.681 ($df = 133$)	0.712 ($df = 226$)	0.703 ($df = 225$)	0.687 ($df = 131$)	0.684 ($df = 130$)
F Value	33.689 ($df = 4; 133$) $p < .001$	56.898 ($df = 4; 226$) $p < .001$	48.053 ($df = 5; 225$) $p < .001$	21.910 ($df = 6; 131$) $p < .001$	19.328 ($df = 7; 130$) $p < .001$

Note: All values are z-standardized. The presented p-values are two-sided.

Table 4: Stepwise Multiple Regression Analysis Results of the Prediction of IM

4.4 RQ2: Does Students' Perceived CA Differ Between Lecture Courses and Seminars?

Results are presented in Table 5. Overall, students perceived the total CA in seminars as significantly higher than in lectures ($d = 0.71$). Moreover, the TLA ($d = 0.62$) and eedback effectiveness ($d = 0.85$) was perceived as significantly stronger in seminars than lectures. No statistical differences were found for ILO Clarity and AT alignment.

Measures of CA	Lecture		Seminar		t	Cohen's d
	M	SD	M	SD		
Total CA	3.37	.70	3.82	.60	$t(136) = -4.13$ $p < .001$	.71
ILO Clarity	3.77	.83	3.81	.81	$t(229) = -0.39$ $p = .350$	-
TLA	3.47	.73	3.90	.67	$t(229) = -4.67$ $p < .001$	.62
AT Alignment	3.89	.80	3.96	.78	$t(136) = -0.50$ $p = .308$	-
Feedback Effectiveness	2.61	1.08	3.51	1.05	$t(229) = -6.42$ $p < .001$	.85

Table 5: Results One-Sided *T*-Tests

5 Discussion

The purpose of this study was to gain a better understanding of the relationship between pCA and student motivation in a higher education setting. In addition to this, the pCA in lectures and seminars was compared.

5.1 RQ1a & RQ1b: pCA as Predictor of IM

There were three key findings of the regression analyses. First, – in line with the expectations – pCA significantly predicted IM (*Interest and Joy* subscale). Second, the single components of pCA also significantly predicted IM. Third, pCA as a whole scale, as well as the subscales *ILO Clarity* and *Teaching Alignment*, predicted IM beyond the three needs defined by SDT. These findings are consistent with Roßnagel et al. (2021), who identified ILO Clarity as a significant predictor for perceived competence and IM. In contrast to this study, the authors did not find TLA Alignment to predict perceived competence or IM. Feedback Effectiveness failed to predict IM (beyond the SDT needs). The most compelling explanation is that there was relatively much variance in the *Feedback Effectiveness* scale, meaning that some students perceived the given feedback as not effective, and some perceived it as effective. As it was not directly asked whether students had received any feedback at all in their course, it is possible that students who perceived the feedback as not effective did not get any feedback. In further research, additional items could clarify what proportion of students actually received feedback that could be perceived as effective or ineffective. In this sample, there might have been too many outliers in the negative direction, leading to a failure of feedback effectiveness to predict IM. It is expected, that if students perceive the feedback as effective, it could predict IM.

Contrary to expectations, AT alignment did not predict IM. This may be due to only two-thirds of students completing all ATs, with about a third receiving feedback. Additionally, three of five items on the AT Alignment scale focused on grades, potentially causing confusion. When examining only students who completed all assessments, received feedback, and filled out the questionnaire, pCA significantly

predicted IM and SDT subscales, but AT Alignment still couldn't predict IM (see appendix). This may be because the course content and assessment criteria weren't clearly communicated, hindering students' ability to evaluate alignment and contributing to higher non-response rates. Varying course structures and assessment practices may also complicate students' judgments. The measurement of IM should be critically considered, as the *Interest and Joy* subscale is context-sensitive and may not generalize beyond specific situations. Additionally, it cannot distinguish between situational affects and enduring intrinsic motivation. Nonetheless, the subscale remains a valuable and reliable tool, capturing key indicators of IM and used in many studies (Ryan, 1982).

5.2   RQ2: Differences in pCA Between Lecture Courses and Seminars

In line with initial expectations, we found that students' pCA is significantly higher in seminars compared to lectures. Looking into the dimensions of pCA, analysis showed that students perceive the TLA as significantly more aligned in seminars than in lectures. Two of the five items in this subscale directly asked about opportunities for active participation in the learning process and whether learners were offered a variety of activities in the course. The results suggest that lectures remain relatively passive teaching formats, whereas seminars provide students with the opportunity to interact with the instructor and peers, allowing them to shape their learning process. Moreover, *Feedback Effectiveness* was perceived to be higher in seminars than in lectures. One reason might be the smaller group size in seminars, which allows a more productive student-teacher interaction than in lectures and enables a deeper engagement with the learning content (Wisniewski et al., 2019). Contrary to our expectations, students' perception of *ILO Clarity* and *AT Alignment* did not differ between students in seminars and lectures. This means, that in both teaching formats the ILOs were perceived as clearly stated, and the ATs were also perceived as aligned. Possible interpretations of the latter are that either lectures adopted to alternative examination formats or the ILOs were at an adequate level of the SOLO-taxonomy to be in line with classic lecture examinations. Hereby SOLO is short for

"Structure of the Observed Learning Outcome". It classifies learning outcomes by complexity, reaching from unistructural to extended abstract, and focuses on quality rather than quantity of correct answers (Biggs & Collis, 1982).

6   Limitations

We aimed to investigate a broad group of students and therefore collected the data during the semester. Therefore, only 39 % of the students completed all assessment tasks and received an evaluation for them. As three of the five items on the AT Alignment scale refer to grades, it would be helpful to either revisit the questionnaire or make sure all students have received their grades for the chosen course. Furthermore, only data regarding pCA and motivation were collected. However, further details on the courses, such as course design, performance measures, and workload, would also be a valuable source of information. To tackle the outlined criticism about the interest and joy subscale additional measurements, such as behavioral observations, could be included.

7   Conclusion and Further Directions

This was the first study focusing on the direct relationship between pCA and IM, integrating SDT as a theoretical approach. We provide evidence that pCA is a predictor of IM. More research is needed to explore these results in more depth. Motivation being a crucial factor in students' learning processes, valuable practical implications for higher education instructors can be drawn from this study. To effectively implement CA, higher education instructors must develop competencies in formulating learning objectives and aligning them to teaching activities and assessment methods. In particular, lecturers should be supported and trained in planning and preparing their teaching. Because teaching at German universities is not professionalized, we recommend integrating knowledge about the effects of constructive

alignment on IM as well as training in developing the above-mentioned competencies in further training courses such as the didactics certificate in Germany. Structuring courses according to CA could contribute to increasing students' perception of the usefulness of the learning content, which would further boost motivation. So, the results also emphasize the high relevance of the ongoing professional development of instructors in higher education.

Appendix

Due to the character limit of the ZFHE, the questionnaires and more detailed statistics can be found online at: https://doi.org/10.5281/zenodo.15173270

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