

Perceptual Indicators for Teaching Quality: Transforming SET Data into Learning Analytics Tools for Adult Online Instructors

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Abstract. *This study examines a modified Students' Evaluation of Educational Quality (SEEQ)-based questionnaire adapted for adult online learners as a potential perceptual layer for learning analytics. Conducted at Algebra Bernays University in Croatia with 161 adult learners in online professional programs, the research analyzes relationships between teacher interactivity dimensions (motivation, constructive feedback, availability, discussion initiation, communication frequency) and overall satisfaction. Results show high satisfaction levels ($M = 4.18$, $SD = 0.55$) and identify teacher motivation ($\beta = .411$, $p < .001$) and constructive feedback ($\beta = .207$, $p = .010$) as the strongest unique predictors of satisfaction, together explaining significant variance ($R^2 = .607$, adjusted $R^2 = .594$). Building on these findings, we propose a proof-of-concept framework wherein SET-based interactivity scores function as interpretable, teacher-centered indicators for learning analytics dashboards and rule-based early-warning systems. The framework demonstrates how perceptual data from established evaluation instruments can be transformed into actionable metrics (e.g., Motivation Score, Feedback Quality Score) with traffic-light categorization to support timely pedagogical interventions in adult online education.*

Keywords. learning analytics, Student Evaluation of Teaching (SET), perceptual indicators, motivation, constructive feedback

1 Introduction

Online education for adult learners has expanded rapidly in recent years, creating flexible pathways for upskilling and reskilling, but also raising new questions about how to ensure and monitor the quality of online teaching. In this context, teacher interactivity – including motivation, constructive feedback, availability and use of interactive methods – has

emerged as a key determinant of learners' satisfaction and engagement. Student Evaluation of Teaching (SET) instruments are widely used to capture learners' perceptions of teaching quality, yet they are still predominantly treated as isolated, summative quality assurance tools rather than as explicit inputs to learning analytics pipelines. Building on this gap, the present study examines a modified SET questionnaire developed for adult online programs as a potential perceptual signal for learning analytics and proposes a proof-of-concept framework in which SET-based measures of teacher interactivity are conceptualised as interpretable indicators for future dashboards and early-warning models.

2 Background and Literature Review

A substantial body of research shows that the quality of teacher–student interaction is a key predictor of engagement, satisfaction and learning outcomes in online environments. Large-scale evidence from 334 universities indicates that **teaching presence** – particularly the facilitation of discourse and provision of feedback – is a central determinant of students' online learning experience and satisfaction (Li & Wang, 2024). Recent work on instructor presence and interactive tools similarly demonstrates that perceived instructor presence, together with the use of interactive technologies, significantly predicts student engagement and satisfaction in hybrid learning environments (Park & Kim, 2020). Conceptual and empirical syntheses emphasise that **instructor interactivity** – through timely responses, personalised feedback and proactive communication is strongly associated with online student satisfaction and persistence (e.g., Roque-Hernández et al., 2024), converging with earlier findings that interactive teaching behaviours shape both learners' affective

experience and cognitive outcomes in digital environments (Sun & Chen, 2022).

Recent literature further underlines the importance of motivational and relational dimensions of online teaching. For instance, Pham and Nguyen (2025) explain that teaching presence in virtual learning environments is strongly connected with learners' perceptions of support, communication quality and overall course satisfaction. Furthermore, many authors emphasise that meaningful interaction, timely feedback and motivational support remain among the strongest predictors of persistence and engagement in online education (Bergdahl et al., 2024).

Student Evaluation of Teaching (SET) instruments are among the most widely used tools for capturing learners' perceptions of teaching quality at course and program level in higher education (Spooren et al., 2013). Within this family, the Students' Evaluation of Educational Quality (SEEQ) developed by Marsh (1982, 1984) is recognised as a reliable, valid and multidimensional instrument covering aspects such as organisation/clarity, enthusiasm, group interaction, individual rapport, breadth, examinations and overall rating (Marsh, 1982, 1984). Adaptations of SEEQ in different languages and systems have confirmed its factor structure and psychometric robustness, supporting its use as a basis for localised evaluation instruments (e.g. Daumiller et al., 2021 for the German adaptation). In online contexts, SET/SEEQ-derived evaluations have shown that students particularly value well-organised courses, engaging activities and instructors who are responsive and courteous in digital communication (Bolliger & Martindale, 2004; Watermark Insights, 2024). Despite this, SET results are still predominantly treated as end-of-course feedback rather than as structured data streams that could be integrated with other learning analytics signals.

In line with a widely used definition, **learning analytics** refers to systematically measuring, collecting, analysing, and reporting data about learners and their contexts to better understand and improve learning processes and environments (Lang, Siemens, Wise, Gašević & Merceron, 2022). Building on this perspective, the *Handbook of Learning Analytics (2nd ed.)* emphasises the integration of diverse data sources and methods to support both learners and educators, highlighting the need for interpretable indicators that can inform pedagogical decision-making (Lang et al., 2022). In practice, learning analytics implementations typically rely on log-level traces from learning management systems (logins, clicks, time on task), assessment data and indicators of participation in online activities (Papamitsiou & Economides, 2014), while predictive approaches increasingly apply machine-learning algorithms to forecast outcomes such as completion, grades or dropout risk in higher education (Čotić Poturić, 2024). Empirical work has shown that multiple data sources – LMS logs, assessment results and survey data – can be combined

to assess student learning and course effectiveness in online courses (Harrati et al., 2016), yet perceptual data such as course evaluations and satisfaction surveys remain underused as first-class input variables and are often only reported descriptively alongside behavioural indicators (Lang et al., 2022; Čotić Poturić, 2024). This limitation has become increasingly evident in many learning analytics research studies, which argue that many existing analytics implementations primarily focus on behavioural traces and may overlook the perceptual and affective dimensions of learning experiences (Bergdahl et al., 2024).

Research in human-centred learning analytics further highlights this issue. Alfredo et al. (2024) explain that learning analytics and AI-supported educational systems should focus on interpretability, transparency and pedagogical usefulness, rather than depend only on predictive optimisation. Furthermore, de Vreugd et al. (2024) argue that instructors require actionable and pedagogically meaningful indicators instead of isolated behavioural metrics, while Herodotou et al. (2025) show that both students and instructors benefit from analytics systems that communicate engagement, support and learning progress in a comprehensive manner.

Bridging this gap requires reconceptualising SET not only as a summative evaluation instrument, but as a structured, learner-centred source of perceptual indicators that can complement behavioural and performance data within learning analytics frameworks (Lang et al., 2022). Dimensions measured by SEEQ-derived instruments – such as good teaching, clear goals and standards, assessment quality, workload and general skills – as well as items explicitly targeting teacher interactivity, offer interpretable variables that align closely with pedagogical concepts and instructor decision-making (Marsh, 1982, 1984; Daumiller et al., 2021).

In the context of online learning, where teaching presence and instructor interactivity are empirically linked to engagement and satisfaction (Li & Wang, 2024; Park & Kim, 2020; Roque-Hernández et al., 2024), SET-based measures of motivation, feedback and interaction are particularly promising as teacher-facing analytics indicators. Building on examples where survey data are combined with LMS and performance data in online courses (Harrati et al., 2016; Papamitsiou & Economides, 2014) and on regional work demonstrating the use of machine-learning methods in predictive learning analytics in higher education (Čotić Poturić, 2024), the present study examines a SEEQ-based instrument adapted for adult online programs as a candidate perceptual layer in learning analytics, and explores how its interactivity scales can be transformed into interpretable indicators and rule-based scenarios for dashboards and early-warning models.

3 Research Problem and Objectives

Learning analytics has advanced considerably in leveraging behavioural and performance data to monitor and support students, but there is still a lack of interpretable, teacher-centred indicators that can feed into models of satisfaction and risk in adult online programs. Existing systems predominantly rely on log data and grades, which reveal what learners do but say little about how they experience teaching quality and teacher interactivity in digitally mediated environments (Siemens & Baker, 2012; Papamitsiou & Economides, 2014). At the same time, Student Evaluation of Teaching (SET) instruments are widely used to capture perceptions of teaching in online and on-campus courses, yet they are rarely integrated into learning analytics pipelines or used as structured signals in predictive or diagnostic models (Spooren et al., 2013; Ifenthaler & Yau, 2020). This creates a disconnect between student-centred evaluation practices and data-driven infrastructures: teachers typically receive static, end-of-course SET reports, while analytics dashboards omit perceptual indicators that would make patterns of engagement and satisfaction more pedagogically interpretable. In the context of adult online education – where teacher-student interaction is a proven determinant of engagement and satisfaction (Sun & Chen, 2022; Yuan et al., 2022) – this lack of integrated, teacher-centred indicators limits the potential of learning analytics to support timely, targeted improvements in teaching practice.

In response to this problem, the present study has four objectives:

1. to examine adult learners' satisfaction with online teaching in professional programs at a Croatian higher education institution using a modified SET questionnaire tailored to adult online learners;
2. to analyse the relationships between different aspects of teacher interactivity (e.g., motivation, constructive feedback, availability, facilitation of discussion, use of online tools) and overall satisfaction with online teaching;
3. to assess the predictive power of teacher-interactivity aspects for overall satisfaction by means of multiple regression analysis, thereby identifying which dimensions function as the strongest perceptual predictors; and
4. to propose a proof-of-concept framework in which SET-based measures of teacher interactivity are conceptualised as candidate input variables for learning analytics dashboards and rule-based early-warning indicators in adult online programs.

4 Research Hypotheses

Based on the outlined research problem and objectives, and building on prior empirical findings on teacher-student interaction, satisfaction and SET in online learning (Alfredo et al., 2024; Sun & Chen, 2022; Yuan et al., 2022; Spooren et al., 2013), the study tests the following hypotheses:

- H1: Adult learners report a significantly high level of satisfaction with online teaching, as measured by the modified SET questionnaire.
- H2: Aspects of teacher interactivity (motivation, constructive feedback, availability, facilitation of discussion, communication frequency, use of online tools and interactive methods) are significantly positively associated with adult learners' overall satisfaction with online teaching.
- H3: A combination of teacher-interactivity aspects significantly predicts adult learners' overall satisfaction with online teaching.

5 Methodology

The study employed a cross-sectional, quantitative research design based on an online questionnaire, with a subsequent proof-of-concept interpretation in terms of learning analytics. Data were collected at a single point in time from adult learners enrolled in online professional programs and analysed using descriptive statistics, correlation analysis, and multiple regression to address the stated hypotheses. In addition to the conventional psychometric and predictive analyses, the results were re-interpreted through a learning analytics lens by identifying which questionnaire scales could serve as interpretable, teacher-centred indicators for future dashboards and early-warning rules.

5.1 Sampling and Participants

The target population comprised adult learners enrolled in fully online programs of adult education at Algebra Bernays University in Croatia. All participants were engaged in online professional programs leading to partial qualifications or micro-credentials in fields such as graphic design, UX design, web development and related digital competencies. A non-probability convenience sampling approach was used: an invitation to participate in the study was distributed via email to all adult learners registered in online programs and the survey was also advertised through the institution's website and social-media channels. Participation was voluntary and anonymous.

A total of 161 participants took part in the study. The majority of participants identified as female (60.9%), with 36.0% male and 3.1% choosing not to disclose their gender. The most represented age group was 25-34 years (44.7%), followed by 35-44 years

(30.4%), 45-54 years (14.3%) and 18-24 years (9.3%), with a small proportion aged 55-64 years (1.2%). Regarding educational attainment, 41.6% held a Master's degree, 16.8% a Bachelor's degree and 34.2% had completed secondary school, with smaller proportions holding specialist or doctoral degrees. Most respondents were currently employed (72.7%), reflecting the profile of working adult learners, while 19.3% were unemployed and smaller groups reported other statuses (e.g., self-employed, student, retired). In terms of experience with online education, 58.2% had been involved in online learning for less than six months, 35.4% for 6-12 months, and a minority for longer periods (1-2 years or more than two years).

5.2 Instrument: Modified Student Evaluation of Teaching (SET)

For this study, we used a student-evaluation instrument based on the Students' Evaluation of Educational Quality (SEEQ) questionnaire developed by Marsh (1982), which is a reliable, valid and useful tool for collecting students' evaluations of university teaching across multiple dimensions (Marsh, 1982, 1984). SEEQ has been adapted and validated in various languages and higher-education systems, confirming its multidimensional structure and psychometric robustness (Daumiller et al., 2021). Building on this foundation, the SEEQ-based instrument was translated into Croatian and linguistically adapted to the context of adult learners in online programs at Algebra Bernays University, with items kept as close as possible to the original content while ensuring clarity and relevance for the local context.

In addition to the core SEEQ dimensions, two global items were added: an overall rating of the instructor and an overall rating of the online tools and platforms used in the course. These additions were motivated by evidence that online learners' satisfaction is shaped not only by traditional aspects of teaching quality, but also by their holistic perception of the instructor and the digital environment (Bolliger & Martindale, 2004; Park & Kim, 2020). Furthermore, a set of items explicitly targeting teacher interactivity in online settings (e.g. motivation, constructive feedback, availability, initiating discussions, use of interactive tools) was included to reflect recent work on teaching presence and instructor interactivity in online classrooms (Li & Wang, 2024; Roque-Hernández et al., 2024). The adapted instrument thus retains the theoretically grounded structure of SEEQ while extending it with context-sensitive items that capture the specific demands of adult online education.

The final questionnaire comprised several multi-item scales grouped into two main blocks. The first block captured different aspects of satisfaction with teaching through the dimensions of good teaching (e.g., clarity of presentation, organisation, preparedness), clear goals and standards (clarity of learning objectives and expectations), assessment

(perceived fairness and appropriateness of assessment methods), workload (perceived appropriateness of the amount and difficulty of work) and general skills (perceived contribution to transferable skills such as problem-solving or communication). Two additional single-item global measures assessed the overall instructor rating and the overall rating of online tools. The second block focused on teacher interactivity in the online environment and included items such as: the teacher motivates participants, the teacher provides constructive feedback, feedback on tests or short quizzes is valuable, the teacher responds only to the most essential questions (reverse-coded), the teacher is regularly available for additional consultations, the teacher regularly initiates discussions and encourages participation, satisfaction with the frequency of communication with the teacher, the teacher's skill in using online tools and platforms, and the use of interactive tools and methods during classes (e.g., group projects, quizzes, simulations). All items were rated on a five-point Likert-type scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"), and scale scores were computed as mean values of the relevant items.

Overall satisfaction was operationalised as a composite score derived from satisfaction-related scales. For each participant, scale scores were calculated as the arithmetic mean of the items within each block (good teaching, clear goals and standards, assessment, workload, general skills, overall rating of the instructor, and overall rating of online tools). The overall satisfaction composite was then calculated as the mean of these seven scale scores, while higher values indicate higher perceived overall satisfaction.

Beyond its primary function as a summative and formative evaluation tool, the modified SET instrument was conceptualised in this study as a potential artefact for learning analytics in adult online education. Specifically, its dimensions - good teaching, clear goals and standards, assessment, workload, general skills and, most importantly, teacher-interactivity items – were treated as **perceptual indicators that** capture how learners experience teaching quality and interaction at a given point in time. In a learning-analytics framework, such perceptual indicators can complement behavioural data from learning management systems (e.g., logins, participation in activities, time on resources) by adding a "perceptual layer" that reflects the learner's viewpoint (Siemens & Baker, 2012; Ifenthaler & Yau, 2020). The present study, therefore, not only analyses these scales using traditional statistical techniques but also explores how they could be transformed into candidate indicators for teacher-facing dashboards and early-warning rules in future analytics-enhanced implementations.

Lastly, the adapted instrument thus combines established SEEQ dimensions of teaching quality with newly developed items tailored to online adult learning environments. Furthermore, in this study, the adapted

instrument is used in an exploratory manner. While it provides a structured framework for capturing adult learners' perceptions of teaching quality and interactivity, the measurement properties of the adapted scales should be regarded as preliminary, and interpretations of the results are made with this limitation in mind.

6 Results

All analyses were conducted using standard procedures for quantitative questionnaire data. Descriptive statistics were first computed for all scales and key items of the modified SET instrument. For each satisfaction-related dimension (good teaching, clear goals and standards, assessment, workload, general skills) and for the global items (overall satisfaction, overall instructor rating, overall rating of online tools), means and standard deviations were calculated to summarise central tendency and variability. As described in Methodology, overall learner satisfaction was calculated as the arithmetic mean of seven scales that measure different aspects of satisfaction.

Descriptive results showed generally high perceived teaching quality and satisfaction: **good teaching** had the highest mean ($M = 4.49$, $SD = 0.72$), followed by **clear goals and standards** ($M = 4.43$, $SD = 0.93$) and **assessment** ($M = 4.25$, $SD = 0.88$), while **workload** ($M = 3.65$, $SD = 0.60$) and **general skills** ($M = 3.53$, $SD = 0.98$) were rated somewhat lower but still above the scale midpoint. The **overall instructor rating** ($M = 3.95$, $SD = 0.55$) and **overall rating of online tools** ($M = 3.74$, $SD = 1.14$) indicated generally positive, though more varied, perceptions of the instructor and technological environment, and the **composite overall satisfaction score** confirmed a high satisfaction level ($M = 4.18$, $SD = 0.55$).

To test H1 (that adult learners report a significantly high level of satisfaction), satisfaction ratings were categorised (2, 3, 4, 5) and a chi-square test was used to examine whether the distribution differed from a reference distribution. The analysis confirmed H1 as it showed a statistically significant deviation, with ratings of 4 and 5 occurring much more frequently ($N = 140$) than ratings of 3 ($N = 19$) or 2 ($N = 2$), $\chi^2(3) = 109.48$, $p < .001$, supporting the conclusion that satisfaction was significantly high. The distribution of satisfaction categories and chi-square test results is presented in Table 1.

Table 1. Chi-square test results

Participant satisfaction	Observed N	χ^2	p value
2	2	109.484	.000
3	19		
4	89		
5	51		

To address H2 (associations between teacher interactivity and satisfaction), Pearson correlations were computed between overall satisfaction and each **instructor interactivity** item. All correlations were statistically significant at $p < .001$ thus confirming H2. The strongest positive associations were observed for "The teacher motivates participants" ($r = .645$), "The teacher provides constructive feedback" ($r = .642$) and "Feedback on tests or short quizzes is valuable" ($r = .661$), indicating that motivation and feedback quality are closely linked to satisfaction. Medium to large positive correlations were also found for availability for consultations ($r = .442$), initiating discussions and encouraging participation ($r = .487$), satisfaction with the frequency of communication ($r = .500$), skill in using online tools ($r = .412$) and the use of interactive tools and methods ($r = .352$). The only negatively keyed item, "The teacher responds only to the most essential questions of participants", showed a medium negative correlation with satisfaction ($r = -.322$), suggesting that minimal responsiveness is associated with lower satisfaction. Pearson correlations between all teacher-interactivity indicators and overall satisfaction are reported in Table 2.

Table 2. Correlation matrix (interactivity vs. satisfaction)

Item	Correlation with Satisfaction	p-value	N
Teacher motivates participants.	.645**	.000	161
Teacher provides constructive feedback.	.642**	.000	161
Feedback on tests or short quizzes is valuable.	.661**	.000	161
Teacher responds only to the most essential questions of participants.	-.322**	.000	161
Teacher is regularly available for additional consultations.	.442**	.000	161
Teacher regularly initiates discussions and encourages participation.	.487**	.000	161
Satisfied with the frequency of communication.	.500**	.000	161

cation with the teacher.			
Teacher is skilled in using online tools and platforms.	.412**	.000	161
During classes we use interactive tools and methods (e.g., group projects, quizzes)	.352**	..	161

To test H3 (predictive power of teacher interactivity aspects), a multiple linear regression analysis was conducted with overall satisfaction as the dependent variable and five interactivity indicators as predictors: teacher motivates participants, teacher provides constructive feedback, teacher is regularly available for consultations, teacher regularly initiates discussions and encourages participation, and satisfaction with the frequency of communication.

The choice of five interactivity indicators as predictors in the primary regression model was based on theoretical and practical considerations. Specifically, teacher motivation, constructive feedback, availability, discussion facilitation and communication frequency were considered to represent the key interpersonal dimensions of teacher presence. The remaining items were retained as complementary descriptive indicators of online teaching practice and were therefore analysed through descriptive statistics and correlation analyses.

Multiple linear regression was conducted to examine the extent to which selected indicators of instructor interactivity are statistically associated with overall satisfaction with distance teaching. Considering the exploratory nature of this study and the constraints of the available dataset, the formal diagnostic tests of regression assumptions, such as normality of residuals, homoscedasticity, linearity, or multicollinearity, were not conducted. The regression results are interpreted with caution, and the estimated regression coefficients should be viewed primarily as descriptive indicators of the relative strength of associations between interactivity indicators and overall satisfaction.

The model showed a strong overall fit, $R = .779$, $R^2 = .607$, adjusted $R^2 = .594$, $F(5, 155) = 47.91$, $p < .001$, indicating that approximately 59.4% of the variance in satisfaction was explained by the set of interactivity predictors and thus confirming H3. Table 3 shows the regression model summary and Table 4 the ANOVA results.

Table 3. Regression model summary

Model	R	R ²	Adjusted R ²	Std. error of the estimate
1	.779	.607	.594	.34992

Table 4. ANOVA table of regression analysis

Model	Sum of Squares	df	Mean Square	F	p-value
1 Regression	29.331	5	5.866	47.908	.000
Residual	18.979	155	.122		
Total	48.310	160			

Inspection of individual coefficients revealed that only teacher motivation ($\beta = .411$, $p < .001$) and constructive feedback ($\beta = .207$, $p = .010$) made statistically significant unique contributions, whereas availability ($\beta = .067$, $p = .344$), initiating discussions ($\beta = .127$, $p = .126$) and satisfaction with communication frequency ($\beta = .088$, $p = .367$) were not significant when considered alongside the other variables. This pattern suggests that, although many aspects of interactivity correlate positively with satisfaction, **the quality of motivation and constructive feedback** are the most critical predictors when examined jointly. Table 5 details the regression coefficients for each interactivity predictor.

Table 5. Regression coefficients

Coefficients					
Model	Unstandardized Coefficients	Standardized Coefficients		t	p-value
	B	Std. Error	Beta		
1 (Constant)	1.859	.167		11.116	.000
Teacher motivates participants.	.230	.043	.411	5.323	.000
Teacher provides constructive feedback.	.136	.052	.207	2.615	.010
Teacher is regularly available for additional consultations.	.040	.042	.067	.948	.344
Teacher regularly initiates discussions and encourages participation.	.069	.045	.127	1.540	.126
Satisfied with the frequency of communication	.048	.053	.088	.906	.367

with the teacher.					
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7 Discussion

7.1 Interpretation of Key Findings

The results indicate a consistently high level of satisfaction with online teaching among adult learners, with overall satisfaction averaging above 4 on a 5-point scale and the “good teaching” dimension receiving the highest ratings. These findings are in line with recent large-scale studies showing that when teaching presence is strong – particularly in terms of organisation, facilitation and feedback – students report positive online learning experiences and satisfaction (Li & Wang, 2024). In this sample, learners perceived instructors as well prepared, clear and organised, which likely contributed to the positive overall evaluations and aligns with the dimensions emphasised in SEEQ-based evaluations (Marsh, 1982, 1984).

Additionally, the findings contribute to recent discussions in learning analytics research by showing that perceptual indicators derived from SET instruments capture dimensions of learning experience that behavioural traces alone do not entirely clarify. Since learning analytics systems mostly rely on clickstream data, attendance metrics and activity logs, affective and perceptual dimensions of learning may remain underrepresented (Bergdahl et al., 2024). These findings hence support the argument that students’ perceptions of teaching quality serve as an important data source within learning analytics systems.

The correlation and regression analyses highlight the central role of teacher motivation and constructive feedback in shaping satisfaction. Large positive correlations between these aspects and satisfaction, combined with their status as the only significant predictors in the regression model, suggest that they are the primary perceptual drivers of how adult learners experience online teaching quality. This pattern resonates with recent empirical work demonstrating that teaching presence, especially facilitation, motivation and timely feedback, is a strong predictor of online satisfaction (Li & Wang, 2024, Pham & Nguyen, 2025), and with studies showing that instructor presence and interactive tools together support engagement and satisfaction (Park & Kim, 2020; Roque-Hernández et al., 2024). Importantly, not all interactivity aspects uniquely predicted satisfaction once motivation and feedback were included in the model: availability for consultations, initiating discussions and communication frequency showed positive bivariate correlations but did not contribute significantly in the multivariate analysis. This suggests that while these aspects are valued, their effects may be mediated through or overshadowed by the perceived

quality of motivational climate and feedback, which is informative when prioritising indicators for both teaching practice and learning analytics design.

7.2 Proof-of-Concept Learning Analytics Framework

The SEEQ-based SET instrument used in this study provides a structured set of perceptual indicators that capture how adult learners experience key aspects of teaching, particularly teacher interactivity. In line with calls from the *Handbook of Learning Analytics* to integrate diverse, interpretable indicators into analytics workflows (Lang et al., 2022), these scales can function as a perceptual layer that complements behavioural and performance data typically used in learning analytics (Siemens & Baker, 2012; Papamitsiou & Economides, 2014). Because SEEQ-derived dimensions such as good teaching, clear goals, assessment quality, and especially motivation and feedback are directly interpretable by instructors, they are well-suited as teacher-facing dashboard indicators that translate complex learner experiences into concise, pedagogically meaningful metrics (Marsh, 1984; Daumiller et al., 2021; de Vreugd et al., 2024).

The empirical patterns showing strong predictive power of teacher motivation and constructive feedback can be readily implemented as simple dashboard widgets and rule-based alerts within existing LMS, which already employ traffic-light visualizations for risk indication. For example, Moodle plugins and platforms like IntelliBoard use red-amber-green indicators to flag at-risk learners based on behavioral traces. However, the novelty of this approach lies in applying such familiar traffic-light categorization to perceptual data derived from modified SET questionnaires. A teacher dashboard could display a Motivation Score and Feedback Quality Score (on a 5-point scale) alongside overall satisfaction (see Fig. 1). Courses could be classified using thresholds informed by observed distributions – green (low risk) when both scores are ≥ 4.0 (indicating high predicted satisfaction), yellow (moderate risk) when either score falls between 3.0 and 3.5 (suggesting targeted improvement), and red (high risk) when both scores drop below 3.0 (triggering flags for pedagogical support). This repurposing of established evaluation instruments as perceptual indicators aligns with prior work integrating survey and behavioural data (Harrati et al., 2016; Herodotou et al., 2025) and guidance on designing interpretable analytics for educators (Lang et al., 2022, Pan et al., 2024), demonstrating how existing SET results can be transformed into actionable, teacher-centered learning analytics tools.

The specific cut-points used in this traffic-light scheme (3.0 and 4.0) are heuristic and intended to provide an intuitive, interpretable visual summary for educators. In the present study these bands were not validated against external outcomes such as course

completion, performance, or retention, so the colour coding should be interpreted as a descriptive aid, and not as a prescriptive standard.



Figure 1. Teacher-facing learning analytics dashboard showing low motivation and feedback scores (yellow/red-risk indicators)

In a more advanced learning analytics implementation, these perceptual indicators could be combined with behavioural data (e.g., declining engagement in forums, reduced attendance in live sessions, lower completion of online activities) to refine early-warning logic. For instance, a course with borderline motivation/feedback scores and a downward trend in engagement metrics could be prioritised for timely support, whereas a course with similar SET scores but stable or improving engagement might require less urgent action. Although such integration lies beyond the scope of the present dataset, the scenarios presented here demonstrate how a theoretically grounded exploratory adaptation of SET dimensions – particularly teacher motivation and constructive feedback – can function as interpretable, teacher-centred signals within future learning analytics dashboards for adult online programs.

8 Limitations and Implications for Future Research

This study was conducted in a single higher-education institution and within a specific context of online adult-education programs, which limits the generalisability of the findings to other institutional settings, disciplines or learner populations. Future research should therefore replicate and extend the study across multiple institutions and diverse program types to examine whether the identified patterns – particularly the prominence of teacher motivation and constructive feedback – hold in different organisational and cultural contexts.

The cross-sectional design and exclusive reliance on self-report data introduce additional limitations. Because all data were collected at one point in time using a questionnaire, the study cannot capture temporal dynamics or establish causal relationships between teacher interactivity and satisfaction.

Even though the questionnaire is created on a well-established framework for student evaluations of teaching, we did not estimate reliability coefficients or examine the factor structure of the adapted satisfaction scales and newly introduced interactivity items. The absence of this evidence means that the dimensional validity and internal consistency of some scales in the adult online education context remain uncertain, and the present findings should therefore be interpreted as an initial, exploratory contribution.

Moreover, SET responses may be affected by social-desirability tendencies, response styles or contextual factors unrelated to teaching quality. These constraints point towards the need for longitudinal designs, the inclusion of behavioural and performance data from LMSs, and the use of more advanced modelling approaches (e.g., predictive or multimodal learning analytics models) that triangulate perceptual indicators with objective traces of learner engagement and outcomes.

A methodological limitation of the present study is the absence of formal diagnostic checks for the assumptions underlying multiple linear regression. As a result, the regression findings should be considered provisional and interpreted as exploratory evidence regarding patterns of association. Future studies should also compare alternative regression models and evaluate potential multicollinearity of conceptually related predictors.

The learning analytics component remains conceptual in the absence of real LMS log data. Therefore, the next step is to collect longitudinal SET data (e.g. mid-course and end-of-course) and align them with time-stamped LMS traces such as forum activity, attendance in synchronous sessions and assignment submissions. This would allow researchers to test whether low perceptual scores on motivation and feedback co-occur with specific behavioural patterns and whether integrated models outperform models based on behavioural or perceptual data alone. In this way, SET can evolve from a static evaluation tool into a dynamic, learner-centred component of multimodal learning analytics pipelines for adult online programs.

9 Conclusion

The study shows that adult learners in online programs report high levels of satisfaction with teaching and that among various aspects of teacher interactivity, teacher motivation and constructive feedback emerge as the strongest statistical predictors of reported satisfaction within the present sample. Considering the cross-sectional nature of the study, these findings reflect predictive associations rather than causal effects. References in this article to “predictors” or to “key areas” for professional development should therefore be understood as aspects of interactivity that are strongly linked to satisfaction in the context of this

study. Conceptually, the work positions modified SET interactivity scales not only as evaluation tools, but as candidate learning analytics indicators, demonstrating how they can be used to derive interpretable teacher-centred metrics and simple rule-based scenarios for dashboards and early-warning rules in adult online programs.

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