Synergizing CDIO Framework and Sustainable Development Goals in Psychological Assessment

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Abstract

This paper investigates the integration of the CDIO (Conceive, Design, Implement, Operate) framework and the Sustainable Development Goals (SDGs) into psychological assessment teaching and analyzes the impact of this integration on student competencies. Data collected from 134 psychology students showed that the combined integration significantly and positively predicted competency levels. The combined integration significantly and favorably predicted competency levels, according to data gathered from the respondents ($R = 0.618$; $R2 = 0.382$; $F(2, 131) = 40.478$; $p < 0.001$). In the CDIO model's practical phases, Implement ($M = 3.49$) and Operate ($M = 3.44$), students reported the greatest gains, indicating a successful integration of theory and practice. Students' ethical and global understanding of psychological evaluation was enhanced by the integration, particularly with regard to SDGs 17 (Partnerships for the Goals) and 3 (Good Health and Well-Being). Students were less confident in theoretical issues, such as differentiating between classical and modern test theories ($M = 2.79$ and $M = 2.78$, respectively), but they expressed high confidence in applied competencies, particularly in the administration and use of assessment tools ($M = 3.32$). Overall, the findings demonstrate how crucial it is to incorporate CDIO and SDG ideas into Psychological Assessment teaching materials in order to improve competency-based learning and ensure future psychometricians are prepared professionally.

Keywords: *Psychological Assessment; CDIO Framework; Sustainable Development Goals (SDGs); Psychometrics; Instructional Material.*

1. Introduction

Psychological assessment refers to a type of testing where several techniques are used to discover assumptions on people and their behavior, skills, and personality (Framingham 2016). Psychological testing or psychological assessment is also known as a battery of psychological tests on subjects (Humboldt, Rolo, & Leal, 2021). There are multiple components of a psychological evaluation, such as norm-referenced tests, informal surveys, information collected through an interview, medical reports, and observations, which a psychologist selects and depends on depending on the exact questions he or she asks (Eabon and Abrahamson, 2022).

Psychological assessment is a methodology that enables the definition of students' strengths, weaknesses, and learning styles, providing guidance for intervention, testing, and advice. It is founded on cognitive, psychomotor, and affective spheres and enhances performance and behavior by boosting the level of motivation, performance ability, and knowledge in students. The platform provides a psychological evaluation of student behavior framework, where it gathers information on behavior design, offers insights to enhance behavior and solve problems, and stabilizes academic performance and student behavior (Zou, Wu, and Zhang, 2022).

Ineffective learning strategies, such as cramming before exams, are common among psychology students and often result in low knowledge retention. The issue that teachers are confronted with is the necessity to encourage effective learning strategies and discourage less effective ones, and online study-aids can be used to accomplish this (Poorthuis and Dijk, 2020). There are challenges related to teaching psychological assessment, such as the inability of the students to use theoretical knowledge in reality, a great gap in learning between school and practical clinics.

Psychological assessment is a very important skill in clinical, counseling, and school psychology and students are required to master it in order to become proficient in the professional positions. A review study established that the low utility of summarization, highlighting, and rereading is associated with high utility of distributed practice and practice testing. These are key strategies to effective learning at various ages, environment and contents. Distributed practice or scheduling or spacing refers to the distribution of learning episodes instead of learning everything at once. This plan is effective in learning by enhancing the memory and retrieving. Nevertheless, most psychology students continue to cram, which is frequently preceded by exams (Poorthuis and Dijk, 2020).

CDIO model equips graduates to work in the industry, as it empowers real-world tests and assessments of psychology and permits graduates to adjust to the evolving demands and exchange the best practice with reputable colleges (Zabalalwi, 2018). Conceived-Design-Implement-Operate (CDIO) This method of teaching engineering education was first introduced in engineering education but has since been extended by non-engineering education to educate their respective disciplines. As stated by the research conducted by Pham et al. (2021), The

researchers compared 40 students of the previous year experimental group and 40 students of the control group, and five tests of five fields were conducted. The findings were found to be significantly different with CDIO-implemented students scoring higher than control students having a p-value of .000.

The Sustainable Development Goals are set on the path of eliminating poverty, conserving the environment, and safeguarding the well-being of everyone. The 2030 Agenda of sustainable development has 169 targets, SDG 3 of which is healthy living at all ages. Social and economic problems such as housing, poverty and education however affect health and well-being. A significant issue to the WHO European Region is mental diseases and mental health and wellbeing should be promoted by all sectors (Mental Health (MHF), 2018). Some of the objectives associated with psychology are eradication of poverty, alleviation of hunger, enhancement of health, education and gender equality, employment, economic development, reduction of inequality, sustainable development, fostering peace, and consolidating alliances to attain the same (Eloff, 2020).

In the analysis of the 17 Sustainable Development Goals (SDGs), Ferrer-Estévez and Chalmeta (2021) report that the research examined 160 papers published within the last decade on education and the 17 Sustainable Development Goals (SDGs) to contribute to the further evolution of education research and the discoveries and challenges in the field. The analysis is useful in the achievement of the 17 SDGs and it leads to the development of the field. Relating on these findings, the study offers an in-depth insight into the topic given that it proposes six classes of research as well as a model that educational establishments ought to use in integrating the Sustainable Development Goals (SDGs) into their activities. This model incorporates stakeholder visions, establishes an international approach of a continuous improvement strategy, action plan implementation, and measurement of results.

Psychology students should be taught of psychological tests and their uses. Thus, it is essential to carry out psychological assessment. It can affect the validity and reliability of the test; this is why many students struggle to understand whether the process they have applied in the standardized tests was right. Giving this test may be very difficult since some students may not be confident on whether they got it right.

Hence, this research is essential as a psychologist. This is important in equipping future psychologists, psychometrics, and psychiatrists with knowledge of the underlying concepts, procedures, and techniques of administering psychological assessment. Nevertheless, the value of this research is greater than the psychological assessment completed; this research will also inform instructors on the best way to teach psychological assessment to psychology students.

The present research will assess and improve the Psychological Assessment Instructional Material based on the application of the Conceive-Design-Implement-Operate (CDIO Framework and the Sustainable Development Goals (SDGs). It attempts to find out how these integrative methods can aid in enhancing student understanding and application and general competency in psychological assessment.

Specifically, the research addresses three big issues. The first one analyzes the significance of one of the applications of the CDIO Framework and the SDGs in psychological assessment teaching and how these frameworks influence instructional delivery and student engagement. Secondly, it evaluates the psychological assessment competency status of the respondent students, their strengths, and weaknesses in using the principles and methods of psychological testing. Finally, the paper reveals the extent to which the combination of the CDIO Framework and SDGs is a predictive of competence in psychological assessment among students, therefore, creating a correlation between the presence of innovative pedagogical practices and academic performance in it.

2. Literature Review

The study research literature talks about the context of Enhancing Psychological Assessment Learning Material using CDIO and SDGs Integration. The researcher gathered and analyzed the pertinent research to reach sensible conclusions on the topic using different sources of data including past studies and electronic databases. These acted as data collection guidelines to respond to the research issues and fulfil the research objectives.

2.1. Psychological assessment

Psychological assessment is an important component of the psychology training which gives the basis to the evidence-based diagnosis, intervention planning, and behavioral evaluation. ===Instead of concentrating only on the definition of the assessment, the recent literature highlights the role of the assessment in giving students their analytical, interpretive, and decision-making skills. It entails the collection and synthesis of data to come up with a sound and significant psychological assessment of a person. The information can consist of cognitive, emotional, and behavioral indicators, which are obtained with the help of standardized tests, interviews, and observation instruments (Abidogun, 2023).

According to Hunboldt, Rolo, and Leal (2022), psychological assessment is an organized process of psychological cognition, emotional, and behavioral functioning measured through standardized processes that are carried out by qualified personnel. Clinical psychologists normally undertake diagnostic tests in order to assist in formulating treatment (Castan & Brentano, 2017). Modern studies however extend this definition to be applicable to more than clinical setting with a focus on the instructional and developmental use in a school setting.

The essential concepts of psychological assessment, which are frequently described in educational material, include the differences between testing, measurement, evaluation, and assessment, the roles and responsibilities of test users. Students are exposed to the principles of psychometrics, validity, reliability and ethical use of tests by textbooks such as Psychological Testing and Assessment. Nevertheless, researchers believe that the conventional teaching resources are usually too abstract and lack pragmatism. The psychological evaluation can inform the adjustment of the curriculum and planning of student growth (Mallillin, 2024). However, Mihura, Roy, and Graceffo (2017) stress that, although the training in assessment is already part of psychology programs, students often do not get the chance to engage in a real-life assessment process, which creates a continuous theory–practice gap.

The assessment tools also guide the teacher to comprehend how students learn, think, and socio-emotional processes, which cause more effective instructional planning (Eabon and Abrahamson, 2022). They play a role in the process of formative assessment, self-regulation development, and reflective learning (Mourenza, 2022). Psychological assessment helps students through finding strengths and weaknesses to enhance their discipline, time management, and stress management (Agarwal, 2023).

Some of the instruments measure emotional and social well-being indicators like anxiety, optimism, and family patterns of relationship. A common example of such tests is structured interviews, standardized examinations, and systematic observations, which are used to make personalized academic accommodations and intervention plans (Mallillin, Atendido, and Tecson, 2022). Zurbriggen (2018) adds that behavioral assessments enable schools to be proactive to socio-emotional issues, whereas Weisbrot et al. (2023) emphasize that they can be

used to determine risk factors and inform clinical or educational treatment. The Perceived Stress Scale and similar instruments can offer an understanding of the pattern of stress-responses in students and help to maintain a socio-emotional state (Kosherbayeva, 2024).

Academic performance and behavioral functioning can only be known through psychological testing. It incorporates specific guidelines on purpose, target population, scoring and administration and is frequently used to guide curriculum change. Teachers also contribute significantly to using assessment knowledge in order to deal with behavioral challenges. Assessment competency gives teachers the skill to analyze student behavior in the most accurate manner and use cognitive-behavioral models to regulate classroom dynamics (Fava, Andretta, and Marin, 2023). Hanson et al. (2023) also highlight that the knowledge of assessment improves the ability of the psychologist and educators to measure, interpret, and take action on student behavioral statistics.

2.2. CDIO framework

The CDIO (Conceive, Design, Implement, Operate) framework was initially developed to support engineering education, but its principles have since been extended to other fields due to its focus on experiential, inquiry-based and competency based learning. According to recent sources, CDIO promotes higher-order thinking and problem-solving, teamwork, and practical application, which is why it would be a good fit in the psychology programs that demand not only theoretical mastery but also practical assessment competency.

Unlike conventional lecture-based models, CDIO puts learning in contextualized testing of real-world challenges in which students are actively involved in the design, testing and redesigning of solutions. This method is consistent with the modern psychological training objectives, as it focuses on the development of integrative abilities, instead of on passive knowledge acquisition. Pham et al. (2021) reveal that the CDIO-based instruction has a significant effect on student engagement and performance as the instructional tasks are reflected in the real work situation.

CDIO has brought order to simulation-based learning, case-based evaluation, collaborative learning with peers, and reflective practice in the educational of psychology. These elements directly address the long-established gap between assessment theory and applied competency, particularly the limited access students often have to real-life assessment experiences (Mihura et al., 2017). CDIO promotes the analysis of assessment instruments, the application of psychometric reasoning and justification of the interpretive decisions (skills students need to use responsibly), by inspiring them to incorporate design cycles into coursework.

In addition, CDIO approach enhances iterative learning so that the student can optimize their assessment strategies based on practice, feedback and reflection. This is a useful iterative process especially in psychological testing where accuracy, ethical rationale, and depth of interpretations increase with repetitive guided practice. Thus, present-day research makes CDIO a promising pedagogical framework that can be implemented in improving competency-based psychological training.

2.3. Sustainable development goals (SDGs)

The Sustainable Development Goals (SDGs) present an international standard of supporting the well-being, equality, and quality education aspects- aspects that directly overlap with the field of psychological assessment. The literature currently in publication portrays SDGs as development indicators, but it also makes the case that they are educational anchors that improve mental health advocacy, ethical reasoning, and culturally sensitive practices in psychology programs (Boffi et al., 2022).

The SDGs that are especially applicable to psychological assessment are SDG 3 (Good Health and Well-Being), SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 10 (Reduced Inequalities). The process of incorporating these SDGs into psychology programs will enable students to appreciate assessment as a technical practice and a set of practices that foster well-being, equality, and empowerment among various students (Agut & Sales, 2024).

Recent studies emphasize that SDG-based initiatives enhance the engagement level, ethical awareness, and understanding of social factors that determine mental health in students. This transformation will prepare learners with the ability to interpret assessment results in a wider societal and cultural context one of the key skills in contemporary psychological practice. Instead of thinking about test administration too narrowly, SDG integration aims at prompting students to look at such issues as stigma, access, cultural fairness, and mental health disparities.

Additionally, SDG-oriented teaching fosters global citizenship and critical thinking, which subsequently results in a better comprehension of how psychological assessment can help to improve sustainable learning settings. The integration of SDGs helps make students assessment trained in a manner that allows them to perceive individuals in a manner that will minimize bias and respect diversity, as well as contribute to mental health outcomes in the long term (Boffi et al., 2022).

Overall, SDGs enhance the education of psychological assessment through the insertion of ethical, cultural, and societal insight into the technical education, which improves the competency of future practitioners who need to address the mental health demands of more and more diverse populations.

3. Methodology

The present research used cross-sectional predictive research design and is quantitative in nature. Cross-sectional research is a snapshot of the phenomenon being studied in that; a great number of respondents are surveyed only once in time. In this design, the researcher will be able to observe the existence of preexisting relationships between variables without affecting them. Likewise, as explained by Wang and Cheng (2020), a cross-sectional study is an observational study that collects data about a given population sample within a given time, which is why the study is quite appropriate to characterize general traits, analyze the behavioral or health-related variables, and estimate the proportion of population.

The selection of cross-sectional predictive design was motivated by the fact that it examines correlations between variables and predicts results using the identified predictors variables. This method is especially suitable when research makes use of structured questionnaires to be discounted through the Internet, mails, a phone, or in a face-to-face format where the researcher can receive information efficiently and at a specific time, he or she can observe the relationship between variables.

The paper combines both the CDIO (Conceive–Design-Implement-Operate) framework and the Sustainable Development Goals (SDGs) as a theoretical framework. CDIO is a project-based learning model, which is highly practical and focuses on problem-solving and innovation, whereas SDGs offer the global sustainability perspective. The study will be able to examine the technical and cognitive skills gained through CDIO-based activities and how these outcomes relate to socially and environmentally conscious goals by incorporating these

structures. This two-pronged framework aids the research emphasis to establish the ability of educational intervention to be connected to measurable and impactful outcomes.

A systematic process was used in developing a structured questionnaire that was used to collect data. First, the items were developed as a result of a thorough literature analysis of CDIO-based learning and SDG-integrations. Three faculty members, who majored in educational psychology and curriculum design, were used to validate their expertise and, therefore, guarantee content validity. A pilot study on 30 respondents was conducted to test the instrument on clarity, understanding and internal consistency. The Cronbach alpha of the results of the reliability analysis was 0.87, which implies high internal consistency. Some small amendments were done to enhance the clarity and conformity of the items to the theoretical constructs.

This enables a solid analysis of the association of the predictor variables and outcome variables and the reliability and validity of data collection instrument is ensured. The cross-sectional predictive design, therefore, gives a descriptive picture and prophetic data concerning the relationships between the variables of study.

3.1. Conceptual framework

The Input-Process-Output (IPO) model was used as the conceptual framework for the study. The CDIO framework, the integration of the Sustainable Development Goals (SDGs), students' baseline characteristics, and their past knowledge are the inputs used in this model. The procedure entails gathering information on students' competencies, using these frameworks in the teaching and learning of psychological assessment, and performing statistical analyses to look at the connections between predictors and outcomes. The result is the suggested improved teaching materials for psychological assessment, which are based on the study's findings and intended to raise student proficiency. This framework demonstrates how the integration of SDG and CDIO principles can predict and improve psychological assessment competency, directing instructional strategies and curriculum enhancements. The descriptive-predictive design of the study made it possible to evaluate the importance of each framework in influencing learning outcomes and validate student responses.
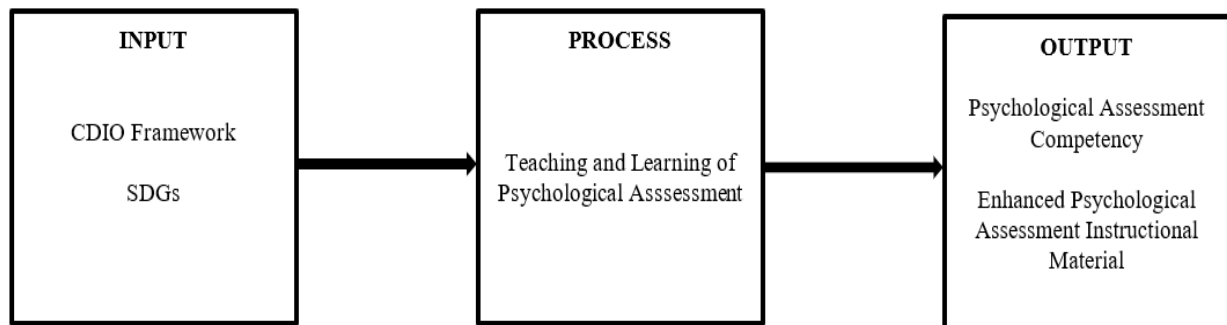

Fig. 1: Conceptual Framework of the Study.

3.2. Sampling design

The study adopted the Input-Process-Output conceptual framework model because its findings were used to propose an integrated enhanced teaching of psychological assessment at one state university, as illustrated in figure 1. This model provided the data required to determine the degree of significance of the CDIO Framework and SDGs in teaching psychological assessment as well as competency in psychological assessment. Following data collection, statistical analysis was performed to determine how the CDIO and SDGs frameworks integrated to predict respondents' psychological assessment competency. in order to confirm the response. The goal of this descriptive-predictive study was to improve the instructional materials for psychological assessments.

The 134 students who responded in total represented the entire population of students enrolled in the course during the data collection period. The population size offered a good foundation for in-depth analysis because it was both precisely defined and quantitatively manageable.

The researcher used purposive sampling, more especially total population sampling, a subtype of purposive sampling, to choose respondents. All participants who fit the study's inclusion criteria are specifically chosen using this non-probability technique. It guarantees that every member of the specified population takes part, reducing sampling bias and guaranteeing that the outcomes fairly reflect the traits of the group. This strategy was appropriate because the target subset for the study was well-defined, manageable in size, and directly related to the goals of the investigation.

3.3. Data gathering procedure

The primary tool used by the researcher to collect data was a structured questionnaire. Three main aspects were intended to be measured by the questionnaire: (1) how students felt about the integration of the CDIO framework, (2) how the SDGs were incorporated into the teaching of psychological assessment, and (3) how competent students were in psychological assessment.

Each item of the test was verified by a panel of educational researchers and psychologists as accurate, relevant and comprehensible before it was provided. A pilot test was used to test the instrument and any necessary modification was done based on input.

The researcher administered the questionnaires to the targeted respondents with the permission of the university research office and with their consent. In order to ensure the convenience and fullness of the responses, data was collected online and face-to-face. The objectives of the study, the confidentiality measures and ethical aspects were explicitly communicated to the respondents and the participation was voluntary.

After gathering all the answers, all the responses were coded, tabulated and analyzed statistically using inferential statistics (correlation and regression analysis) to determine the predictive value of psychological assessment competency of students with the integration of CDIO and SDG models, and descriptive statistics (mean, frequency and percentage) to generalize the answers.

4. Results

The following are the findings of the researcher on this study:

4.1. The level of importance of the integration of CDIO framework and SDGs in teaching psychological assessment

Table 1: Respondent's Assessment in the Effectiveness of the Integration of the CDIO Framework in Teaching Psychological Assessment

Indicators	Composite Mean	Verbal Interpretation
1) Conceiving	3.30	Very Important
2) Designing	3.34	Very Important
3) Implementing	3.49	Very Important
4) Operating	3.44	Very Important

Table 1 will show the perceptions of the respondents regarding the usefulness of CDIO framework in training to be psychologically assessed. The competencies in this study were operationalized as the effectiveness of the students to use knowledge and skills within the four stages of CDIO; Conceive (generating ideas and understanding objectives), Design (planning and structuring assessments), Implement (carrying out the assessments in practice), and Operate (applying and refining skills in simulated or real-life situations). Every step was estimated based on Likert-scale items, which consisted of self-reported proficiency and perceived significance of the activity by students. The findings demonstrate that the mean scores were between 3.30 and 3.49, which means that the respondents regarded all stages as very important when it came to facilitating learning. Implementing (M = 3.49) had the highest score which implies that the students consider the application of psychological assessment techniques as the most important step in successful learning. It was followed by the Operating phase (M = 3.44) with the emphasis on the need to engage in practice and training of skills in real or simulated conditions. The value of planning and conceptual understanding in the learning process was reflected in the ratings of Designing (M = 3.34) and Conceiving (M = 3.30) which were rated somewhat lower but were still rated as very important.

All in all, these results suggest that the implementation of the CDIO framework in psychological assessment teaching could be seen as very useful, especially in the process of creating experiential learning. This implies that student's study effectively by taking what they have studied and putting them into practice, as opposed to studying theory. The fact that the ratings are high in all stages is also indicative that to attain strong assessment competencies a balanced approach of combining planning, conceptualization, implementation and operation is necessary.

Table 2: Respondent's Assessment in the Effectiveness of the Integration of SDGs in Teaching Psychological Assessment

Indicators	Composite Mean	Verbal Interpretation
1) Good health and well-being (SDG 3)	3.49	Highly Important
2) Quality education (SDG 4)	3.36	Highly Important
3) Gender equality (SDG 5)	3.32	Highly Important
4) Decent work and economic growth (SDG 8)	3.38	Highly Important
5) Industry, innovation, and infrastructure (SDG 9)	3.33	Highly Important
6) Reduced stereotypes (SDG 10)	3.34	Highly Important
7) Peace, justice, and strong institutions (SDG 16)	3.37	Highly Important
8) Partnerships for the goals (SDG 17)	3.39	Highly Important

Table 2 shows the data of the respondents regarding the inclusion of the Sustainable Development Goals (SDGs) in the training of psychological assessment. The operationalization of competencies in this study consisted of the capacity of the students to identify, implement and reflect SDG principles in the setting of psychological assessment. Namely, the measurement of each SDG indicator was the level of knowledge of how students could interpret the goal, apply it to their assessment practices, and reflect on its implications towards social responsibility, ethical practice, and global awareness.

The findings demonstrate composite means of 3.32 3.49, which implies that all indicators of SDG were rated as of high importance by the respondents. The best rated goal was SDG 3 -Good Health and Well-Being (M=3.49), implying that the students consider the promotion of mental health and well-being a primary outcome of the implementation of SDGs into their course. Next in line, SDG 17 17 Partnerships for the Goals (M = 3.39) shows that the students value the significance of teamwork and shared accountability in meeting educational and developmental goals. Such SDGs as Quality Education (SDG 4, M = 3.36) and Peace, Justice, and Strong Institutions (SDG 16, M = 3.37) were also not the least significant, as they demonstrate the awareness of the importance of ethical and inclusive practices among the respondents in educational settings. Although it was also rated as slightly lower, Gender Equality (SDG 5, M = 3.32) was also regarded as incredibly important, which shows that the importance of this factor is not underestimated.

These results indicate that students view adoption of SDGs in psychological assessment training as a feasible solution to enhance diversity, social responsibility, and awareness of the world, as opposed to being an abstract and theoretical measure. That is, SDGs are considered as practical roadmap that assists students to associate their study with practical social and ethical issues in the world.

4.2. Competency in psychological assessment

Table 3: Respondent's Assessed Competency in Psychological Assessment Based on their Attainment of the Topic Outcomes

Item Statement	Composite Mean	Verbal Interpretation
1) I can define psychological tests and their uses.	3.12	True to me
2) I am knowledgeable about raw scores and frames of reference for test score interpretation.	3.10	True to me
3) I can identify the truth and error in psychological measurement.	2.78	True to me
4) I can differentiate classical test theory from item response theory.	2.79	True to me
5) I can differentiate categories and relevance of different assessment tools and techniques.	3.02	True to me
6) I know how to clarify referral questions.	2.90	True to me
7) I am familiar with the administration, scoring, and interpretation of different assessment tools.	3.32	Very true to me
8) I can demonstrate and show mastery in conducting specified assessment tools.	2.86	True to me
9) I am familiar with the general guidelines for making psychological reports.	3.21	True to me
10) I know how to make a comprehensive and well-written psychological report.	2.98	True to me

Table 3 indicates the competency of the respondents in psychological assessment, using the measurement of the effectiveness with which they could accomplish the learning outcomes of the topic. The concept of competencies in this paper was based on how the students could use the knowledge and skills in administration, scoring, interpretation, and reporting psychological tests, and the ability to critically analyze the measurement accuracy and theoretical concepts used. Every question on the survey was based on a particular area of these competencies and represented practical skills (e.g., test administration and scoring), as well as analytical skills (e.g., being able to spot measurement errors and know the psychometric theory).

The findings indicate that composite mean scores lie between 2.78 and 3.32 and denote fairly positive levels of competency. The top-ranked one, which is I am familiar with the administration, scoring, and interpretation of different assessment tools (M = 3.32) implies that students are most sure about the practical application skills, i.e., administering and scoring tests. The second-ranked point, which is the next highest-rated one, is the belief of being conversant with the overall principles of conducting psychological reports (M = 3.21). On the other hand, the poorest rated question, which is the one about the ability to determine the truth and mistake in psychological measuring (M = 2.78), shows that the ability to critically analyze and understanding of the theoretical constraints of the measurement performance should be strengthened.

Altogether, the results indicate that, the students have good procedural and applied skills, nevertheless, there is still a necessity to enhance the level of theoretical knowledge and analytical capabilities to provide more precise and critical analysis of tests.

4.3. Integration of CDIO and SDGs framework in predicting psychological assessment competency

Table 4: Model Summary of the Integration of CDIO and SDGs framework in predicting Psychological Assessment Competency

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.618[a]	.382	.373	.3063577	.382	40.478	2	131	.000	1.809

a) Predictors: (Constant), SDG, CDIO.
b) Dependent Variable: Competency.

Table 4 reflects the predictive model where the combination of the CDIO and SDGs frameworks affect psychological assessment competency of the students. In this research, the operationalization of competency was the capability of the students to apply, analyze, and interpret psychological tests, including practical skills (e.g., the ability to administer and score tests), reporting skill and critical assessment of test accuracy. CDIO integration and SDG integration are the predictors in the model, which connote structured and experiential learning processes and the integration of socially and globally relevant goals in the curriculum, respectively.

The findings show that the predictors have a moderate positive correlation with the dependent variable and the correlation coefficient is R = 0.618. The value of R^2 is 0.382 which indicates that the joint effect of the CDIO and SDG integration explains the fact that about 38.2 percent of the variability of students in the assessment of psychological competency can be explained. The strength of the model is verified by the value of the Adjusted R^2 of 0.373 that explains the number of predictors. The model has statistical significance (F = 40.478, p < 0.001) as it proves the idea that the combination of CDIO and SDG frameworks is a significant predictor of competency. The Durbin-Watson (1.809) value shows that the values of autocorrelation of the residuals are not significant and this confirms the validity of the model.

All in all, the model establishes that the implementation of CDIO and SDG models can help to improve the practical, analytical, and socially informed skills of students in a meaningful way and empirically support the idea of a curriculum plan that should combine the elements of an experiential learning process with the goals of global sustainability.

Table 5: ANOVA Results for the Integration CDIO and SDGs Framework in Predicting Psychological Assessment Competency

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.598	2	3.799	40.478	.000[b]
	Residual	12.295	131	.094		
	Total	19.893	133			

a) Dependent Variable: Competency.
b) Predictors: (Constant), SDG, CDIO.

The ANOVA results for predicting students' psychological assessment competency based on the integration of the SDG principles and the CDIO framework are shown in Table 5. The ability of the students to apply, analyze, interpret, and report psychological assessments—including practical test administration, scoring, report writing, and critical evaluation of measurement accuracy—was operationalized as competency in this study. The predictors, CDIO and SDG integration, stand for curriculum integration of socially and globally relevant objectives as well as organized, hands-on learning.

The regression model fits the data well, according to the ANOVA results. The model explains a significant amount of the variation in student competency, as evidenced by the regression sum of squares (7.598), residual sum of squares (12.295), and total sum of squares of 19.893. The statistical significance (p < 0.001) of the computed F-value of 40.478 with 2 and 131 degrees of freedom indicates that the integration of CDIO and SDG frameworks has a significant effect on students' competency levels.

This means that when the curriculum incorporates experiential, project-based learning (CDIO) and learning activities related to socially relevant, sustainability-oriented goals (SDGs), students' performance and comprehension of psychological assessments significantly improves. Practically speaking, the ANOVA shows that these two frameworks work well together to predict both analytical and practical skills in psychological assessment.

Overall, the ANOVA demonstrates the significance of incorporating experiential learning and sustainability principles into psychology education, supporting the conclusion that the CDIO and SDG frameworks significantly contribute to improving students' competencies.

Table 6: Coefficients of CDIO and SDG Integration in Predicting Psychological Assessment Competency

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.640	.265		2.416	.017
	CDIO	.368	.107	.342	3.456	.001

	SDG	.332	.102	.324	3.273	.001

a) Dependent Variable: Competency.

The regression coefficients for predicting students' psychological assessment competency based on the integration of the SDG principles and the CDIO framework are shown in Table 6. The ability of students to apply, analyze, interpret, and report psychological assessments was operationalized in this study as competency. This included both theoretical knowledge of psychometric concepts and practical skills like test administration and scoring, report preparation, and critical evaluation of measurement accuracy. The predictors, SDG integration and CDIO, stand for socially relevant, sustainability-focused learning activities and structured experiential learning, respectively.

The findings demonstrate that both predictors significantly improve students' competency. With an unstandardized coefficient B = 0.368, standard error = 0.107, t = 3.456, and p = 0.001, the CDIO framework showed a strong positive effect, suggesting that students who participate more fully in CDIO-based, hands-on learning typically attain higher competency levels. With B = 0.332, standard error = 0.102, t = 3.273, and p = 0.001, the SDG framework also demonstrated a positive effect, indicating that incorporating sustainability-oriented principles into instruction improves students' psychological assessment abilities.

While both frameworks are highly meaningful predictors, CDIO (β = 0.342) has a slightly greater impact on competency than SDG integration (β = 0.324), according to the standardized coefficients.

These coefficients can be interpreted as demonstrating that when the curriculum incorporates both socially conscious SDG-based objectives and practical CDIO activities, students' practical and analytical skills improve. To put it simply, students' competency in psychological assessment increases with how well they engage in these structured and socially relevant learning experiences.

Overall, the results show that students' knowledge, skills, and application abilities in psychological testing are greatly improved by the integration of CDIO and SDG frameworks, offering compelling empirical support for integrating both experiential learning and sustainability principles into psychology education.

5. Discussion

The current research design involved a group of 134 students of the Bachelor of Science in Psychology program in One State University in Southern Tagalog, Philippines and the analysis of how the learning materials on psychological assessment could be enhanced by incorporating the CDIO (Conceive-Design-Implement-Operate) framework and the Sustainable Development Goals (SDGs). The research narrowed down to examine how the CDIO methodology can enhance psychological assessment skills and align the learning outcomes with social and global goals, such as gender equality, economic development, health, and quality education. The general objective was to ensure the betterment of education and sustainable social development.

The results suggest that CDIO framework is useful in promoting experiential learning as the scores of Implementing (M = 3.49) and Operating (M = 3.44) are high. The outcomes indicate that students better learn the material and accumulate practice when learning theory is practiced in the real or simulated environment and the ideas of project-based, practical learning in psychological assessment training are correct. In the same measure, SDGs in the curriculum were considered essential especially SDG 3 (Good Health and Well-Being) and SDG 17 (Partnerships for the Goals) in which students are required to be aware of the pertinence of their field within the society. The connection between assessment practices and the goals of sustainable development enabled students to value the larger aspects of their work as far as the global challenges were concerned.

The paper offers some of the viable avenues on how to implement a CDIO and SDG-based curriculum. The curriculum developers will be able to match the course goals with the CDIO levels, SDG indicators, and make every module focused on not only acquiring skills but also socially responsible practices. As an example, assignments can be given to students asking them to create assessments that include ethical factors or encourage well-being in schools and community settings. Some SDG-related goals, like assessing mental health needs of communities or assisting inclusive education efforts, could be combined with project-based modules, in which students conceive, design, implement, and operate psychological assessments. Collaboration with local organizations and stakeholders also contribute to the learning experience as the students can use their skills in the real environment, helping society develop. The use of structured reflection and feedback will support the connection between theoretical knowledge, application, and sustainability principles, providing the students with the motivation to critically evaluate the influence of their work on society.

The conclusions made also imply certain suggestions to teachers and curriculums. In order to comply with both practical competencies and sustainability outcomes, courses should directly reflect the principles of CDIO and SDG in learning objectives. The assessment rubrics must be able to measure not just the technical competence but also the ethical issues, teamwork, and social influence. To fulfill the philosophy of continuous improvement as per CDIO, iteration of project cycles is suggested where the student is able to continue revising his work depending on the feedback. Also, specific reinforcement of theoretical knowledge especially in the area of psychometrics continues to be of critical importance, as students were found to be great in applied skills but lesser in mastering such aspects like classical test theory; item response theory etc. Other forms of interdisciplinary projects that entail relating psychological assessment to societal issues will also aid in improving the student knowledge of what larger implications of their field hold and a sense of civic duty.

In general, it is demonstrated that the combination of CDIO and SDG models considerably forecasts the student competence in psychological assessment, explaining the 38.2 percent of the variance (R = 0.618, R 2 = 0.382) with both CDIO and SDG variables playing a meaningful role in predicting the competency. This goes to show that a well-organized, practical and socially aware curriculum gives holistic and competent graduates. The results highlight the importance of combining applied learning methods with a sustainability approach to ensuring that project-based learning serves not only as a means of teaching technical skills but also as a way of producing psychologists who are sensitive to the world and their ethical and social role in it. The paper identifies that the combination of CDIO and SDG models into the education of psychological assessment encourages the experiential approach to learning and the feeling of social responsibility that can serve as a model of curriculum development that would satisfy the requirements of professional competence and global sustainability objectives.

5.1. Limitations of the study

This study offers useful insights into combining the Sustainable Development Goals (SDGs) and the CDIO (Conceive–Design–Implement–Operate) model to improve psychological assessment learning resources, it is crucial to recognize a number of limitations.

First, only 134 psychology students enrolled in the Psychological Assessment course at one state university in Southern Tagalog, Philippines, participated in the study. The results may be less applicable to other academic programs, institutions, or cultural contexts due to the small sample size and single-institution setting.

Second, all of the data was gathered all at once using a cross-sectional predictive design. This design makes it impossible to establish causal relationships between students' competency and CDIO/SDG integration, even though it is suitable for analyzing relationships and making predictions. To ascertain the long-term impacts and causal pathways of these frameworks on learning outcomes, longitudinal studies would be required.

Third, self-reported questionnaires were used to collect the primary data. This approach raises the risk of self-report bias or social desirability bias, which could compromise the accuracy of the results even though it is helpful for evaluating students' perceptions and experiences.

Fourth, there was no control group for comparison in the study. Determining the degree to which improvements in competency are directly attributable to CDIO and SDG integration rather than other factors is challenging in the absence of a baseline or comparison group.

Fifth, the analysis did not take into account other potentially significant factors like individual motivation, teaching strategies, learning environments, or past academic achievement. The exclusive emphasis on CDIO and SDG integration as predictors of psychological assessment competency may have obscured other variables influencing student outcomes.

Notwithstanding these drawbacks, the study offers useful proof in favor of incorporating CDIO and SDG frameworks into psychology instruction. In order to improve experiential learning and global awareness in psychological assessment training, it provides a helpful resource for future research, curriculum development, and instructional strategies.

6. Conclusion

Based on the collected, analyzed, and interpreted data, the following noteworthy conclusions were made:

1) CDIO (Conceive-Design-Implement-Operate) framework is a highly successful method in teaching psychological assessment particularly in the practical side of assessing and applying the assessment instruments according to the highest result of the respondents.
2) It is presumed that Sustainable Development Goals (SDGs) would be useful in psychological assessment training. The two most relevant persons to enhancing the understanding of global societal issues among students are SDGs 3 and 17 (Good Health and Well-Being).
3) Students showed a high level of proficiency in psychological assessments, especially in the administration, scoring, and interpretation of the testing tools. However, there were still certain areas that needed more help, particularly understanding more complex theoretical concepts like measurement accuracy and classical test theory.
4) When combined, the SDGs and the CDIO framework demonstrate a high predictive ability for 38.2% of the variation in competency levels can be attributed to students' psychological assessment competency. Both SDGs and CDIO are beneficial, but CDIO has a slightly bigger impact.

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