Investigating Teachers' and Students' Readiness for the NC Machining Teaching Cloud Platform Implementation for Integrating Theory and Practice

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Abstract: ***This study investigated the degree of the readiness of teachers and students towards the implementation of the NC Machining Teach cloud platform, and introducing the NC machining teaching cloud platform that integrate theory and practice in Technical and Vocational Training institutes in Ethiopia. The questionnaire was online administered to 57 teachers and 99 undergraduate students from the Ethiopian Technical and Vocational training institutes, and two polytechnic college of Ethiopia. Thus, the researchers use quantitative method. The researcher used descriptive statistics, t - test, and correlation to analyze the data. The study revealed that teaches and student's readiness towards the implementation NC machining teaching cloud platform for NC machine course was high, but more efforts should be made to overcome some hindrances related to infrastructure and lack of tools. The results also showed that there was difference in the degree of readiness between teachers and students towards applying NC machining teaching cloud platform. Furthermore, the results indicated that there was statistically significant difference based on teachers and students in applying NC machining teaching cloud platform. The researcher recommended that there should be more support from the school management in providing the teachers and students with sufficient tools that assist the adoption of NC machining teaching cloud platform. In addition, a strong legal policy should be established to support the mechanisms of adopting NC machining teaching cloud platform in Ethiopia Technical and Vocational training institutes. Upgrading computers in the institutes is very important to meet the increasing needs for speed and efficiency in adopting NC machining teaching cloud platform. The study also introduced the NC machining teaching cloud platform.***

Keywords: NC machining, cloud platform, Readiness, polytechnic college, Ethiopia

1. Introduction

1.1. Background of the study

Numerical control machine technology is one of the main courses for the TVET students. It is a specialized course that should be mastered by manufacturing technology department students. Numerical control technology has been greatly enhanced since early 1950s owing to the advances of electronic and electrical industries. Traditional machines such as lathe, milling machine, drilling machine, grinding machine, punching machine, boring machine, machining center, and metal forming machines have been gradually computerized and/or automated through the integration of a machine control unit (MCU) to enhance control, increase accuracy, repeatability and reduce the dependence of operators etc. based on the powerful numerical computation capabilities.

The functionalities of numerical controlled (NC) machines have also been the key enabler towards the rapid development of precision industry. However, the limitations of NC machines include (1) high initial investment and (2) high maintenance costs. That is to say, NC machines are normally expensive and it is not feasible to provide every student with one NC machine in learning the practice of NC operation in classroom. This is because more and more of the education institute just could no longer be able to afford the expenditure in purchasing new NCs for each student. The price of maintaining existed NCs is also costly and becoming heavier burden in conducting NC classes [1].

Teachers in professional or service - related fields desire their students not only to learn theory and understand why theories are important but also to learn how to apply the theoretical frameworks in practice. Perhaps the difficulty in making the transition from theory to practice arises, at least in part, from a failure of the teacher to integrate both theory and practice into the same course in the curriculum in ways that are relevant and meaningful to the student. Such integration helps students to more closely associate the practical value of learning theoretical concepts. It is imperative that students in professional programs be able to put into practice what they have learned in the classroom. Unless we are able to help students make sense of the link between theories and practice in the immediate context of classroom teaching, students will face problems in bridging the gap between [2]. The vocational and technical normal university should emphasize the cultivation of the double - qualified teacher, who can not only engage in theoretical teaching, but also are competent for the practice teaching [3].

The student who does not have a theoretical background cannot function effectively in a practical setting. The extent of a student's theoretical knowledge therefore constitutes the foundation of practice. McCaugherty (1991: 1061) states that "theory without practice is sterile and practice without theory is blind" [4].

Theory and practice cannot be separated from each other. Wherever such separation does occur, problems of integrating theory and practice arise. If theoretical learning takes place without application in practice, learning becomes distorted and causes students to encounter problems when they are expected to integrate theory and practice. Students should be allowed to spend a longer time in the practical area so they could build confidence in what they were practicing. Theory should always be applied and that teacher should not keep students in a theoretical setting for a long time without permitting them the opportunity to apply theory into practice. Students may even forget the theoretical content that has been taught. If too little time is spent in the practical setting, students will have problems with reflecting on the theoretical content that they have been taught because they would have forgotten it. The period allocated is important for ensuring an effective integration of theory and practice.

Problems existing in numerical control machining teaching: (1) Disconnection (lack of integration) between theory and practice: when learning the theory of numerical control machining, no actual numerical control machine tools has been seen. When practical training, the theory of NC machining has forgotten, cannot achieve the real integration of theory and actual machining. (2) Theoretical teaching and practical training are based on teachers rather than students. Theory teaching, teacher’s lecture in class, students are passive listing. The traditional practical training teaching equipment is limited in quantity, and the ratio of students to teacher is small, which cannot realize one – to – one tutoring well, and students’ satisfaction is not high.

In recent years, the emergence of “Internet plus” has led many countries to launch the teaching mode of online platform, realizing online lesson preparation, teaching and interaction of teachers. This model cannot solve the problem of applying theory to practice. With the appearance of numerical control simulation software, the use of virtual reality technology to simulate real processing is more and more applied. But virtual processing software does not provide theoretical learning.

Nowadays, internet + technology are widely used in many fields. In order to learn the theory and practical knowledge of NC machining anytime and anywhere, this technology can be introduce teaching. When the internet enters the mobile internet ear, APP, as mobile application software, is widely concerned and used by college students nowadays. With the realization of smart campus, wireless network covers the whole school. All these make it possible to introduce internet + into the teaching of NC machining technology.

In view of the above problems, the NC teaching platform on integration of theory and practice of NC machining is developed, which can run on mobile phones, computers and iPods. To realize the integration of theory and practice, to realize the student – oriented, to improve the teaching quality and effect of NC machining technology, and to open up a new teaching mode.

This research tries to investigating teachers' and students' readiness for the NC machining teaching cloud platform implementation for integrating theory and practiceof the NC machining courses and introduces the NC machining teaching cloud platform in Ethiopian Technical and Vocational Training Institutes.

1.2. Research Significance

To make the NC learning more affordable, accessible and less resource intensive, NC machining teaching cloud platform for using the NC machining course is developed based on integration of theory and practice. The NC machining teaching cloud platform encourages hands - on learning by students leading to better learning outcomes. Hands - on education in NC machines and related technologies provide students with creative, innovative, problem solving, and R &D skills. The teaching platform is a virtual learning environment that provides teachers and students with a number of resources that have been created to engage learners and promote collaborative, student – centered learning.

The advances and development of information and communication technology, especially Internet and the World Wide Web, enables learner to acquire information and learning opportunities without time and location constraints. Teaching platform complements the classroom teaching, and together, they serve the rising needs of lifelong learning in the 21st century. The teaching platform support the student's independent knowledge development, critical thinking, reflection and problem solving ability. Furthermore, the teaching platform facilitates an active and creative involvement in teaching, in order to stimulate the student's development of professional competence.

1.3. Research Objectives

The objective of this study is to investigate the level of teachers' and students' readiness for integration of the NC machining teaching cloud platform into the teaching of NC machining courses and introduce the NC machining teaching cloud platform to Technical and Vocational Training Institutes in Ethiopia

2. Methodology

2.1 Research Design

The study adopted a descriptive survey design to determine the level of readiness for integration of NC machining teaching cloud platform in the teaching of NC machining course in in Technical and Vocational Training Institutes in Ethiopia. According to Mugenda and Mugenda, (2003), a survey design is used to collect data from members of a population to determine the current status of that population on one or more variable. On the other hand, descriptive research is a process of collecting data to test a hypothesis or to answer questions concerning the current status of the subjects in the study [5]. A descriptive survey, therefore, integrated the survey design in a descriptive research. According to Orodho (2003), in a descriptive survey information is collected by interviewing or administering a questionnaire to a sample of individuals [6]. According to (Borg and Gall, 1989), descriptive survey research is intended to produce statistical information about aspects of education that interest policy makers and educators [7].

According to Orodho and Kombo (2002), a descriptive survey can be used when collecting information about people’s attitudes, opinions or social issues [8]. This made the design suitable because the study is intended to investigate teachers' and students' readiness for integration of NC machining teaching cloud platform in the teaching of NC machining course in Technical and Vocational Training Institutes in Ethiopia. In this investigation, some of the indicators of teachers’ and students’’ readiness which were used include teachers’ attitudes, opinions and habits. The study was intended to produce statistical information about aspects of the integration of NC machining teaching cloud platform in the teaching of NC machining course in Technical and Vocational Training Institutes readiness that is significant to policy makers and all educators.

2.2 Target Population

This study targeted manufacturing technology department teachers and students. The manufacturing technology department teachers and students were purposively selected, because the NC machine course is only available to students from this department. The target population was 57 (5 Female, 52 Male) first degree and second degree teachers from the three Technical and Vocational Training institute satellite center and two polytechnic college, and 99 undergraduate students (15 Female, 84 Male) from one Technical and Vocational Training institute satellite center.

2.3 Data gathering process

The choice of questionnaire technique usually depends on the research question (s) and aim (s) as well as the population or sample from which the data will be collected [9]. The first choice was an online self - administered questionnaire as the main data gathering tool considering the aim of the research. This questionnaire was designed using Google Forms and provided a link to the questionnaire for participants. The links were sent to participants via the Telegram platform, which is the most popular platform in Ethiopia for sharing information and documents easily. The merits of this technique were that it allowed participants the time and space to answer the questionnaire at their convenience and the data was imported to the analytics software automatically and with minimum effort.

2.4 Data analysis Method

Descriptive statistics were used to analyze the collected data and the results presented in form of tables and charts. Descriptive statistics is the term given to the analysis of data that helps describe, show or summarize data in a meaningful way. The researcher used descriptive statistics which is useful to summarize group of data using a combination of tabulated description (i. e., tables), graphical description (i. e., graphs and charts) and statistical commentary (i. e., a discussion of the results).

The data analysis stage began with data coding and cleaning the raw data. The coding process involved defining and labeling each question and respondent including the demographic information. This was converted into a numerical form and the data were then entered into a statistical package (SPSS) V26. In order to ensure the accuracy of entering the scores of each question, the data entry was checked. The next stage of the data analysis process was to discover any score (s) that fell outside the range of possible values for the question score. For example, the minimum and maximum as well as the frequency scores were checked. Finally, an assessment of the data was done to find any possible missing data. The main analysis involved the use of both descriptive and inferential statistical analysis techniques. The descriptive statistics provided a summary of the main features of the data collected. Percentages were used as descriptive statistics in this study. On the other hand, the inferential statistics were used to draw conclusions about the broader population of the study including the use of Pearson’s correlation coefficient and t - test.

2.5 Reliability

The researcher conducted a reliability test in order to measure the internal consistency of the questionnaire. Reliability, therefore, refers to test consistency. The method of determining the reliability of a test by internal consistency is Cronbach’s alpha. This is a single correlation coefficient that is an estimate of the average of all the correlation coefficients of the items within a test. If alpha is high (0.70 or higher), then this suggests that all of the items are reliable and the entire test is internally consistent. If alpha is low, then at least one of the items is unreliable, and must be identified via item analysis procedure.

Table 1: Reliability Statistics

Cronbach's Alpha	N of Items
.802	7

3. Analysis of data, Result and Findings

3.1. Category of respondents

Having obtained the data about participants’ designation, they were categorized as either teachers or students. Out of 156 responses, there were 57 (36.5%) teachers and 99 (63.5%) students, as shown (Table 2 and Figure 1).

Table 2: Category of study participant

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Teacher	57	36.5	36.5	36.5
	Student	99	63.5	63.5	100.0
	Total	156	100.0	100.0	

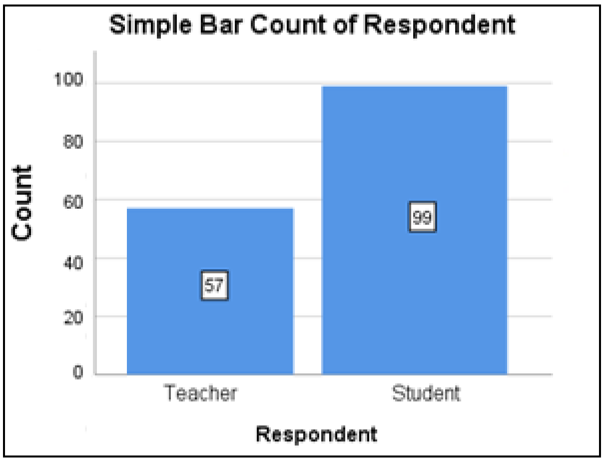

Figure 1: Category of study participant

3.2. Descriptive statistics

This section presents the descriptive statistical data of all identified seven sub - factors with the aim to examine the current level of teachers and student readiness. The presentation is done based on the individual factors beginning with personal drivers.

3.2.1. Personal drivers

Personal drivers are defined in this research in relation to students' and teachers' attitudes, their motivation and time commitment to use NC machining teaching cloud platform in their teaching and learning. In order to explore further the views of students and teachers on personal drivers, five questions about personal drivers were included in the larger questionnaire which was administered to the student and teacher respondents.

In relation to students, the outcome showed that they appeared to be positively inclined towards the NC machining teaching cloud platform (the proportion of respondents choosing agree and strongly agree was 58.18%). On the other hand, student respondents appeared uncertain towards the NC machining teaching cloud platform (that is, the proportion of respondents choosing neutral was 30.30%), and the outcome showed a more negative perspective towards the NC machining teaching cloud platform (the proportion of respondents choosing disagree and strongly disagree was 11.52%).

The outcome for teachers also demonstrated that teachers who responded to the survey appeared to be positively inclined towards the NC machining teaching cloud platform (that is, the proportion of respondents choosing agree and strongly agree was 79.30%). The remaining respondents appeared uncertain towards the NC machining teaching cloud platform (that is, the proportion of respondents choosing neutral was 15.79%), and the outcome showed a more negative perspective towards the NC machining teaching cloud platform (that is, the proportion of respondents choosing disagree and strongly disagree was 4.91%).

3.2.2. Self - efficacy

Self - efficacy in this research is understood to mean the perception of students and teachers of their own individual abilities, knowledge and skills to use NC machining teaching cloud platform. In order to explore further the views of respondents on self - efficacy, five questions about self - efficacy were included in a larger questionnaire which was administered to both student and teacher respondents. These questions reflected on how the respondents perceived their skills on using computers, the Internet and NC machining teaching cloud platform.

Overall, while the students appeared reasonably confident in using computers and the Internet (that is, the proportion of respondents choosing *average skill* and *high skill* was 62.22%), their confidence appeared much less in areas where they were required to use the technology in learning (that is, the proportion of respondents choosing *no skill and low skill* was 37.78%).

Similarly, the outcome showed that teachers appeared reasonably confident in using computers and the Internet (that is, the proportion of respondents choosing *average skill, high skill, and very high skill* was 77.19). However, their confidence appeared less in areas where they were required to use the technology in learning (that is, the proportion of respondents choosing *no skill and low skill* was 22.81%).

3.2.3. Personal access to tools

Personal access to tools in this research is thought of as the availability of computers and Internet for the students and teachers to use at home for NC machining teaching cloud platform. In order to explore further the views of students and teachers on personal access to tools, two questions about computers and the Internet were included in the larger questionnaire which was administered to student and teacher respondents.

Overall, the result showed that student respondents appeared to own or have access to computers at home either all the time (27.3%) or sometimes (51.5%), whereas a third of respondents appeared to have no access to computers at all (21.2%). In terms of the Internet, a slightly higher proportion appeared to have access to the Internet access at home (that is, about 51.5% of respondents appeared to have access to Internet connectivity sometimes and 27.3% had access all the time, whereas 21.2% appeared to have no access to Internet connectivity at all).

On the part of teachers, the outcome of the questionnaire demonstrated that 47.4% of respondents appeared to own or have access to the computer at home all the time, while 42.1% of respondents appeared to have access to the computer at home sometimes. In addition, a minority of 10.5% appeared to have no access to the computer at home at all. In terms of the Internet, the outcome of the questionnaire demonstrated that 42.1% of respondents appeared to have access to Internet connectivity all the time, 47.4% appeared to have access sometimes, and 10.5% appeared to have no access at all.

3.2.4. NC machining teaching cloud platform usability

NC machining teaching cloud platform usability is defined in this research to mean the extent to which participants believe that it will be easy to use or not, and whether or not it will be useful for teaching and learning. In order to explore further the views of students and teachers on NC machining teaching cloud platform usability, six questions about NC machining teaching cloud platform usability were included in the larger questionnaire which was administered to student and teacher respondents.

Overall, the results showed that the majority of students who responded to the survey appeared to be positively inclined towards the NC machining teaching cloud platform based on its usability (that is, the proportion of respondents choosing agree and strongly agree was 49.83%); respondents appeared uncertain towards the NC machining teaching cloud platform based on its usability (that is, the proportion of respondents choosing neutral was 39.73%); and the remaining respondents showed a more negative perspective (that is, the proportion of respondents choosing disagree and strongly disagree was 10.44%).

On the part of teachers, the results revealed that those who responded to the survey appeared to be positively inclined towards the NC machining teaching cloud platform based on its usability (that is, the proportion of respondents choosing agree and strongly agree was 79.53%), and respondents appeared uncertain towards the NC machining teaching cloud platform based on its usability (that is, the proportion of respondents choosing neutral was 14.04%), while the remaining respondents showed a more negative perspective (that is, the proportion of respondents choosing disagree and strongly disagree was 6.43%).

3.2.5. NC machining teaching cloud platform functionality

NC machining teaching cloud platform functionality is defined in this research to mean the extent to which participants believe that the use of NC machining teaching cloud platform will provide flexible and interactive access to instructional and assessment material to facilitate teaching and learning. In order to explore further the views of students and teachers on NC machining teaching cloud platform functionality, five questions about NC machining teaching cloud platform functionality were included in the larger questionnaire which was administered to student and teacher respondents.

Overall, the outcome showed that students who responded to the survey appeared to be positively inclined towards NC machining teaching cloud platform based on its functionality (that is, the proportion of respondents choosing agree and strongly agree was 55.56%); respondents appeared uncertain towards the NC machining teaching cloud platform based on its functionality (that is, the proportion of respondents choosing neutral was 33.94%); and the remaining respondents showed a more negative perspective (that is, the proportion of respondents choosing disagree and strongly disagree was 10.51%).

On the part of teachers, it can be seen that those who responded to the survey appeared to be positively inclined towards the NC machining teaching cloud platform based on its functionality (that is, the proportion of respondents choosing agree and strongly agree was 84.56%), and respondents appeared uncertain towards the NC machining teaching cloud platform based on its functionality (that is, the proportion of respondents choosing neutral was 9.47%), while the remaining respondents showed a negative perspective (that is, the proportion of respondents choosing disagree was 5.96%).

3.2.6. Peer support

Peer support is defined in this research as the assistance and encouragement students and teachers get from their friends and/or colleagues to use NC machining teaching cloud platform. In order to explore further the views of students and teachers on peer support, two questions about peer support were included in the larger questionnaire which was administered to student and teacher respondents.

Overall, the outcome revealed that students who responded to the survey appeared to be positively inclined in relation to peer support (that is, the proportion of respondents choosing agree and strongly agree was 45.45%). and respondents appeared uncertain in relation to peer support (that is, the proportion of respondents choosing neutral was 38.89%), while the remaining respondents showed a negative perspective (that is, the proportion of respondents choosing to disagree was 15.66%).

On the part of teachers, the outcome revealed that those who responded to the survey appeared to be positively inclined in relation to peer support (that is, the proportion of respondents choosing agree and strongly agree was 60.53%), and respondents appeared uncertain in relation to peer support (that is, the proportion of respondents choosing neutral was 21.93%), while the remaining respondents showed a negative perspective (that is, the proportion of respondents choosing disagree was 17.54%).

3.2.7. In - school support

In - school support is defined in this research as how much students and teachers believe that schools would support their use of NC machining teaching cloud platform - that is, through the provision of school management and technical support, as well as the provision of equipment. In order to explore further the views of students and teachers on in - school support, six questions about in - school support were included in the larger questionnaire which was administered to student and teacher respondents.

Overall, the outcome revealed that the students did not believe that school management would support the NC machining teaching cloud platform usage (that is, the proportion of respondents choosing strongly disagree, disagree, and I do not know was 62.12%). In terms of technical support, students perceived poor technical support (that is, the proportion of respondents choosing strongly disagree, disagree, and I do not know was 60.62%). Finally, in regard to the provision of equipment, students perceived a lack of computers and Internet connectivity (that is, the proportion of respondents choosing strongly disagree, disagree, and I do not know was 58.59%).

On the part of teachers, the outcome showed that they believed that school management would support the use of the NC machining teaching cloud platform (that is, the proportion of respondents choosing agree and strongly agree was 63.16%); their belief was also much stronger in relation to the provision of equipment and technical support (that is, the proportion of respondents choosing agree and strongly agree was 69.30 and 65.79, respectively). Tables 26 and 27 below provide the statistical analysis in terms of percentages and frequencies, showing the descriptive statistical data for students and teachers, respectively.

3.3. Inferential statistics showing teachers and students differences

It is worth noting that, in order to identify differences within students and teachers in the readiness, based on the identified underlying factors of readiness, of students and teachers to use the NC machining teaching cloud platform. Since factor score is a continuous variable, a decision was made to use independent t - tests to identify differences within in the readiness of students and teachers to use the NC machining teaching cloud platform. An independent t - test allows for the examination of the hypotheses associated with particular independent variables – that is teachers and students in this case – against the identified underlying factors (dependent variables) of readiness. In doing so, a number of hypotheses were tested with a value of $p < 0.05$ reflecting acceptance of the hypothesis and a value of $p >= 0.05$ rejecting the hypotheses. Before conducting the independent sample t - test, all seven identified underlying factors of readiness were also assessed for normality (±3 in kurtosis and skewness levels) and for outliers. Again, the assessment was conducted separately for students and teachers, and the outcomes indicated that the data are normally distributed and there were no extreme outliers to indicate problematic distribution of the results. The following section will expand on the results of all the independent t - tests for teachers and students against all seven identified underlying factors of readiness for students and teachers.

Students and teachers differences

What are the differences in the readiness of students and teachers to use NC machining teaching cloud platform for NC machining course in Ethiopia Technical and Vocational training institute?

In answering this question, a number of hypotheses based on the seven identified underlying factors of readiness for students and teachers were tested. The result under each of the seven factors based on the independent t - test results is presented below.

3.3.1. Personal drivers

Ha: There is a significant difference in the perceptions of teachers and students in Ethiopia technical and vocational training institute in relation to personal drivers for their use of NC machining teaching cloud platform for NC machining course.

For Ha, the mean score for the teachers (M = 3.93, SD = 0.58) showed a higher agreement with the personal drivers compared to students (M = 3.53, SD = 0.77). This difference was significant [t (142.53) = 3.64, $p < 0.001$], where Cohen's d is 0.58, which is a medium - sized effect according to Cohen (1988). Thus, Ha was supported. Test and descriptive statistics for students and teachers in relation to personal drivers is presented in Table3.

Table 3: Results of t – tests and descriptive statistics for students and teachers in relation to personal drivers

	Respondent	N	Mean	SD	t	df
Personal drivers	Teacher	57	3.9368	.58817	3.644	142.535
	Student	99	3.5354	.77503		

3.3.2. Self - efficacy

Ha: There is a significant difference in the perceptions of teachers and students in Ethiopia technical and vocational training institute in relation to self - efficacy for their use of NC machining teaching cloud platform for NC machining course.

For Ha, the teachers level of self - efficacy (M = 3.10, SD = 0.81) was found to be significantly different compared to the students (M = 2.67, SD = 0.66). This means that the t - test value [t (154) = 3.51, $p < 0.001$] was significant, and Cohen's d is 0.57, which is considered a medium - sized effect. Thus, Ha was supported. The t - test and descriptive statistics for students and teachers in relation to self - efficacy is presented in Table 4.

Table 4: Results of t – tests and descriptive statistics for students and teachers in relation to self - efficacy

	Respondent	N	Mean	SD	t	df
Self – efficacy	Teacher	57	3.1018	.81427	3.519	154
	Student	99	2.6788	.66506		

3.3.3. Personal access to tools

Ha: There is a significant difference in the perceptions of teachers and students in Ethiopia technical and vocational training institute in relation to personal access to tools for their use of NC machining teaching cloud platform for NC machining course.

For this hypothesis, the mean score of personal access to tools for teachers (*M* = 0.57, *SD* = 0.22) compared to the mean score of students (*M* = 0.55, *SD* = 0.23) showed no significant difference. This means that the *t* - test value [*t (*375) = - 0.82, $p > 0.05$] was not significant, and Ha wasrejected. The t - test and descriptive statistics for students and teachers in relation to Personal access to tools is presented in Table 5.

Table 5: Results of t – tests and descriptive statistics for students and teachers in relation to Personal access to tools

	Respondent	N	Mean	SD	t	df
Personal access to tools	Teacher	57	2.3421	.64889	2.490	154
	Student	99	2.0606	.69720		

3.3.4. Peer support

Ha: There is a significant difference in the perceptions of teachers and students in Ethiopia technical and vocational training institute in relation to Peer support for their use of NC machining teaching cloud platform for NC machining course.

For this hypothesis, the mean score of peer support for teachers (*M* = 3.57, *SD* = 0.93) compared to the mean score of students (*M* = 3.39, *SD* = 0.86) showed no significant difference. This means that the *t* - test value [*t (*154) = 1.15, $p > 0.05$] was not significant, and Ha wasrejected. The t -

testand descriptive statistics for students and teachers in relation to peer support is presented in Table 6.

Table 6: Results of t – tests and descriptive statistics for students and teachers in relation to peer support

	Respondent	N	Mean	SD	t	df
Peer support	Teacher	57	3.5702	.93751	1.151	154
	Student	99	3.3990	.86891		

3.3.5. In - school support

Ha: There is a significant difference in the perceptions of teachers and students in Ethiopia technical and vocational training institute in relation to In - school support for their use of NC machining teaching cloud platform for NC machining course.

For this hypothesis, the mean score for teachers (M = 3.54, SD = 0.71) compared to that of students (M = 3.00, SD = 0.71) showed a significant difference. This means that the t - test value [t (154) = 4.58, p < 0.001] was considered significant, and Cohen's d is 0.76, which is a medium - sized effect. Thus, Ha was supported. The t - test and descriptive statistics for students and teachers in relation to in - school support is presented in Table 7.

Table 7: Results of t – tests and descriptive statistics for students and teachers in relation to In - school support

	Respondent	N	Mean	SD	t	df
In - school support	Teacher	57	3.5497	.71267	4.582	154
	Student	99	3.0067	.71266		

3.3.6. NC machining teaching cloud platform usability

Ha: There is a significant difference in the perceptions of teachers and students in Ethiopia technical and vocational training institute in relation to NC machining teaching cloud platform usability for NC machining course.

For this hypothesis, the mean score for teachers (M = 3.95, SD = 0.60) compared to that of students (M = 3.48, SD = 0.69) showed a significant difference. This means that the t - test value [t (154) = 4.23, p < 0.001] was considered significant, and Cohen's d is 0.72, which is a medium - sized effect. Thus, Ha was supported. The t - test and descriptive statistics for students and teachers in relation to NC machining teaching cloud platform usability is presented in Table 8.

Table 8: Results of t – tests and descriptive statistics for students and teachers in relation to NC machining teaching cloud platform usability

	Respondent	N	Mean	SD	t	df
NC machining teaching cloud platform usability	Teacher	57	3.9503	.60337	4.239	154
	Student	99	3.4848	.69092		

3.3.7. NC machining teaching cloud platform functionality

Ha: There is a significant difference in the perceptions of teachers and students in Ethiopia technical and vocational training institute in relation to NC machining teaching cloud platform functionality for NC machining course.

For this hypothesis, the mean score for teachers (*M* = 4.02, *SD* = 0.50) compared to that of students (*M* = 3.58, *SD* = 0.77) showed a significant difference in relation to their perception about NC machining teaching cloud platform functionality. This means that the *t* - test value [*t (*154) = 3.89, *p* < 0.001] was significant, and Cohen's *d* is 0.68, which is a medium - sized effect. Consequently, Ha was supported. The t - test and descriptive statistics for students and teachers in relation to NC machining teaching cloud platform functionality is presented in Table 9.

Table 9: Results of t – tests and descriptive statistics for students and teachers in relation to NC machining teaching cloud platform functionality

	Respondent	N	Mean	SD	t	df
NC machining teaching cloud platform usability	Teacher	57	4.0281	.50063	3.890	154
	Student	99	3.5818	.77780		

4. Conclusion and Recommendation

4.1. Conclusion

The following conclusions have been drawn on the basis of data gathered among the teachers and students in this survey study.

The analysis showed that the majority of the student and teacher respondents were inclined to use the NC machining teaching cloud platform, with the majority of them giving positive responses. In terms of the provision of equipment and technical support in school, the analysis showed that the student respondents indicated that the current level of school support for NC machining teaching cloud platform usage is inadequate. The outcome revealed that student and teacher respondents thought they were likely to be given peer support.

On the teachers' and students' specific questions, the analysis demonstrated that there was no difference between teachers' and students' respondents in terms of personal access to tools and peer support. However, the analysis revealed a statistically significant difference between teachers and students in relation to personal drives, self - efficacy, school support, NC machining teaching cloud platform usability, and NC machining teaching cloud platform functionality—that is, teachers exhibited greater scores in all five factors.

Finally, in terms of correlation, personal drivers were found to be significantly associated with both personal and external factors at different degrees of correlation.

4.2. Recommendations

The study highlighted the need for the creation of equal opportunities between students and teachers in order to bridge the existing gap in the current level of readiness within these groups. Overall, the research outcome also suggests that the student respondents were lacking readiness. This call for more training and support for students. The formulation and implementation of specific strategies that consider the relative strengths and weaknesses of each student should be designed to increase their readiness when NC matching teaching cloud platform is adopted. In addition, students should be provided with more school support regarding their NC matching teaching cloud platform usage, as these factors were identified as barriers peculiar to them in this research.

Schools should be well equipped with the requisite facilities and human resources including computers, Internet connectivity and IT technicians. These facilities should be made available for both students and teachers at all times.

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