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# APPLYING SELF-DIRECTED LEARNING IN TEACHING TECHNICAL DRAWING: RESULTS OF A STUDY IN REAL SITUATION AT UNIVERSITIES OF TECHNOLOGY AND EDUCATION

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**Abstract.** Teaching based on self-directed learning is considered a teaching perspective that focuses the teaching process on learners' learning activities, helping learners to increase their active, positive, and self-disciplined learning, to meet the requirements of lifelong learning. The characteristics of teaching technical drawing at universities require very high self-study in students, from determining learning goals to determining the learning process and ways to achieve results of the highest learning. By the method of quantitative research through survey and analysis of the current situation, the article presents the results of analysis and assessment of the current situation of applying self-directed learning in teaching technical drawing at universities of Technology and Education and analysis and assessment of advantages and disadvantages of applying self-directed learning in teaching Technical Drawing subject. Content of the survey, analysis, and assessment of the current situation based on the learning content characteristics of technical drawing subject, self-directed learning characteristics for students in the university, including the actual situation of goal setting study; status of students' choice of content, methods, and forms of learning. The article applies self-directed learning in teaching technical drawing to students with research results at the universities of Technology and Education. The results of practical research are the scientific basis for assessing students' self-directed learning ability and the ability to apply self-directed learning in teaching practice at the Universities of Technology and Education in Vietnam, meeting the requirements of lifelong learning for learners.

***Keywords*:** self-directed learning, teaching technical drawing, University of Technology and Education, lifelong learning.

## 1. Introduction

The world is starting to enter an industrial revolution 4.0, promising innovation for all professions, and creating a huge change in socio-economic life this is also an opportunity and challenge for the education sector in general and methods for teaching at universities in particular, this requires adjustments to train human resources that are integrated and capable of meeting new standards [1].

Self-directed learning is active, self-disciplined, and positive at a high level of learning. Learners carry out the learning process according to their own goals, directions, and plans. The self-directed learning process helps form and train learners' self-directed ability. Self-directed learning is very suitable for application in training at university to meet the goal of personalizing the teaching process and enabling learners to practice useful skills for self-study and lifelong

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learning [2]. Self-directed learning has been applied by many countries around the world in learning programs for adults, university students, graduate students, or apprentices. The annual international conference on self-directed learning has introduced many projects and research on self-directed learning. Currently, researchers around the world are trying to develop theories of self-directed learning. In Vietnam, self-directed learning has not yet been noticed in teaching theory in general and in the process of teaching students in a group of technical majors in particular.

To assess the actual situation of applying self-directed learning in teaching Technical Drawing subjects, serving as a scientific basis for assessing students' self-directed learning ability and the ability to apply self-directed learning in teaching practice in Vietnam, meeting lifelong learning requirements for learners. The article presents the results of a survey, analysis, and assessment of the current situation of teaching Technical Drawing subjects at universities of Technology and Education in Vietnam according to self-directed learning. In Vietnam, self-directed learning was initially noticed in teaching theory in general and in the process of teaching engineering students in particular.

# 2. Content

## 2.1. Literature review

Self-directed learning is not a completely new thing for higher education, which has a history of more than 160 years of establishing a theoretical foundation about 65 years ago [3]. The term "self-directed learning" or " direction for learning by yourselves " is used to distinguish it from teachers' direct learning which is a form of teaching or a teaching method in which learners determine their own learning goals to draw up a study and research plan. This method is considered to have begun to take shape in the second half of the twentieth century. Malcolm Shepherd Knowles (1913 - 1997), Director of the Association of Education for Adults in the US, had a great impact on American education in the second half of the twentieth century, Knowles published Self-Directed Learning (1975). This work is said to have initiated and founded the Theory of Adult Learning with the original implication to oppose the term "pedagogy" –it is the teaching of children [4]. According to him, programs need to focus more on process, interaction, and direct penetration than on the development of content. More interactive and active teaching methods will be used: surveys for situations, role-playing, games, simulations, or self-assessments. These methods are designed based on practical problems, and how to solve them by using the content of the subject. Through practical experience, learners build their knowledge, and measure their results, and learners themselves are responsible for their learning. He believes that learning of adults (or in other words, a program for training adults) should be built on the following principles:

- Self-directed;
- Experience;
- Readiness to learn;
- Learning orientation;
- Motivation to learn.

Currently, Knowles' theory is that the inherited methods have contributed to increasing the effectiveness of formal courses in universities around the world. Self-directed learning is a process by which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human resources and materials to learn, implementing appropriate learning strategies, and evaluating learning outcomes. Training methods change in the direction of focusing on learning (instead of teaching), personalizing

the learning process, diversifying learning methods with the enhancement of online learning, and learning through experience with the environment and virtual devices. The fundamental reform of teaching and learning is an urgent requirement. The changes that we can make immediately are teaching methods. It is necessary to move from transmitting pure knowledge to forming qualities and developing learners' capacity; change from quantity of lecturers to quality of lecturers, promote creativity, inspire personal potential, build self-study ability, improve knowledge by yourselves, and practice skills. Here, the lecturer is not only the one who leads the students in accessing and acquiring knowledge but also the one who inspires and builds the self-study method. To do that, a teacher must be an example in training, have both "heart" and "reach" to convince learners when approaching the subject, have passion for work, and spread a responsible spirit, really teaching with enthusiasm and heart.

Experiencing the training process in a university environment creates people with expertise, skills, and knowledge to live, survive, have personality, and work effectively, thereby demonstrating their capacity and contributing to society. Graduates must be able to adapt and be creative in all circumstances when the environment and society are constantly changing. The knowledge students gather from the process of studying in lecturers' halls and libraries will quickly become obsolete. Therefore, it is extremely necessary and important to create a self-directed orientation and build learning methods for students.

Regarding self-directed learning strategies, in 2004 Tracy Thompson and Sherry Wulff implemented the Guided Self-Directed Learning Strategy in intermediate and advanced chemistry courses. The project of researching this action, based on instructor-observed learning problems, is connected to students' self-directed skills. Preliminary findings suggest that the systematic implementation of self-directed learning strategies focusing on teaching has solid potential to support student development as autonomous learners and to enhance the teaching environment [5].

Regarding self-directed learning styles, in 2013, Abdel-Hady El-Gilany, and Fawzia El Sayed Abusaad studied Self-directed Learning Readiness and Learning Styles of Saudi Arabian University Nursing [6]. This study was conducted to determine the readiness of nursing students in Saudi Arabia for self-directed learning; to identify their learning styles and find connections between these two concepts. The high level of self-directed learning and the converging learning style that prevails among nursing students. This will have a positive signification for their continuing nursing learning after working in their field.

In 2018, Tim Piper, Thomas Smith, Jorge Jeria, and Robert Intrieri, studied Developing Self-Directed Learning Scales for Exercise. Development and scoring of the Self-Directed Exercise Scale. The self-directed learning tool for the exercise scale was tested on 368 self-directed exercisers and 217 new exercise people. Scores from the tool show a high degree of valid support and predictability for classifying practitioners. This study aimed to develop and provide robust evidence for scores from a measure of self-directed learning in exercisers. The tool developed for this study will be called the Self-Directed Learning Task Scale [7].

Research on self-directed learning for doctoral students, in 2020, Tracy H. Porter, Cheryl Rathert, and Diane A. Lawong devoted themselves to self-directed learning research: Lessons for assessing the experience of doctoral students. This research has several significance for doctoral students, teaching advisors, and universities. First, it is the only study that applies self-directed learning at the doctoral level and is therefore added to the document on self-directed learning. Second, these results provide a potential approach that university leaders may want to consider for their doctoral programs [8].

In recent years, self-directed learning and the application of self-directed learning in teaching have also been interesting in research in Vietnam. Although this research direction is relatively new. However, initially, the authors also have remarkable results that can be implemented into

practice. In 2016, Nguyen Thi Cam Van in the study "Teaching according to self-directed learning theory in training home economics teachers" said that self-directed learning is a highly active activity of learners throughout the entire learning process. From their own needs, interests, and learning conditions, learners actively determine learning methods, develop learning plans, implement plans, and evaluate learning results [9]. Thereby, self-directed learning is a high-level active learning process for learners right from the early stages of determining the direction and strategy for learning. In 2017, the authors Truong Minh Tri, Bui Van Hong & and Vo Thi Xuan also studied the application of the self-directed learning approach in technical teaching at Ho Chi Minh City University of Technology and Education. In this study, the authors have proposed a model and teaching process according to a self-directed learning approach and applied it in teaching Technical Drawing [10]. Inheriting this research result, in 2018, the authors researched students' self-directed learning ability and conducted a survey, analysis, and assessment of the current situation of students' self-directed learning ability. Student at the Ho Chi Minh City University of Technology and Education [11]. Research results show that students have self-directed learning ability and teachers can apply this form of learning in teaching activities. Also in the direction of researching applying self-directed learning in teaching, Truong Minh Tri & Bui Van Hong have carried out several studies on proposing application processes and teaching processes for each specific learning content in teaching Technical Drawing subjects. Research results have shown that the self-directed teaching and learning process is when learners and lecturers discuss to come up with an action plan and decide what content to learn by the immediate goals, and long-term goals [12]. The purpose of the lecturer is to meet the actual needs of the learners. This method is very suitable for developing human learning skills such as creative and research skills, and is independent in skills scientific research.

The research question: Is self-directed learning ability necessary for engineering students to learn the technical drawing subject?

## 2.2. Research methods

The article uses the method of quantitative research. This method collects and analyzes information based on the data obtained from the survey. The purpose of quantitative research is to give out survey conclusions, through the use of statistical methods to process data and information [13]. In this approach, a one-group posttest-only design model is used. According to this model, individuals in the research will participate in a post-test (output check) after a process of receiving a certain impact. The steps of the method are the following:

- Location: Survey at 4 universities of Technology and Education in Vietnam (Hung Yen University of Technology and Education, Nam Dinh University of Technology and Education, Ho Chi Minh City University of Technology and Education Minh, Vinh Long University of Technology and Education).

- Survey subjects: 650 students studying technology and engineering majors, 50 educational managers, and lecturers of universities of technology and education.

- Survey method: Survey by questionnaire, observation, interview, statistics, summarizing experience.

- Rating scale (divided by level and score).

***Table 1. Rating scale***

| *Levels* | *Poor* | *Average* | *Good* | *Very Good* |
|---|---|---|---|---|
| Score | 1 | 2 | 3 | 4 |

Evaluation of the level, scoring: Applying the formula (Max-Min)/n (Table 2) to calculate the discriminant interval between the levels, the discriminant interval between the levels of performing management and teaching in technical drawing subject is 0.75. Therefore, we have the results described in Table 2.

***Table 2. Level of assessment and standards***

| Level | Level of standard for assessment |
|---|---|
| Level 1 - Not good (Poor) | $\overline{X} < 1.75$ |
| Level 2 - Average | $\overline{X} = 1.75 \div 2.50$ |
| Level 3 - Good | $\overline{X} = 2.50 \div 3.24$ |
| Level 4 - Very good | $\overline{X} = 3.25 \div 4.00$ |

## 2.3. Research results

Based on the learning characteristics of Technical Drawing subjects at universities of Technology and Education, the characteristics of self-directed learning, the content of the current survey includes:

- Students define learning goals;
- Students choose learning content;
- Students choose the form of study;
- Students choose learning methods and forms;

From the results of the analysis and evaluation of the survey contents, the article analyzes the advantages and disadvantages of applying self-directed learning in teaching mechanical engineering drawing for students of Technology and Engineering majors at current universities of Technology and Education.

### 2.3.1. Students define learning goals

Assessing students' views on determining learning goals in Technical Drawing subjects at universities of Technology and Education, the results of the survey on the current situation of students and determining learning goals are described in Table 3.

***Table 3. Levels of self-determined students' learning goals***

| Level | Poor | | Average | | Good | | Very good | | $\overline{X}$ | Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| | Q.ty | % | Q.ty | % | Q.ty | % | Q.ty | % | | |
| 1 | 026 | 04.0 | 190 | 29.2 | 122 | 18.8 | 312 | 48.0 | 3.10 | 1 |
| 2 | 256 | 39.3 | 237 | 36.5 | 121 | 18.7 | 036 | 05.5 | 1.90 | 5 |
| 3 | 150 | 23.0 | 198 | 30.2 | 192 | 29.9 | 110 | 16.9 | 2.40 | 2 |
| 4 | 253 | 38.9 | 223 | 34.3 | 038 | 05.8 | 136 | 21.0 | 2.08 | 4 |
| 5 | 246 | 37.7 | 220 | 34.8 | 010 | 01.5 | 168 | 26.0 | 2.15 | 3 |

Level 1: Achieve high results in exams.

Level 2: Fill gaps in knowledge to adapt to training requirements.

Level 3: Practise the habit of self-discipline, and work with a plan.

Level 4: Foster learning methods and skills to apply knowledge to life.

Level 5: Train will, capacity for creative activities, and lifelong learning in the context of Industrial Revolution 4.0.

The results of the survey show the current status of students' views on determining learning goals for the Technical Drawing subject in the direction of self-directed learning at 5 different levels, of which at Level 1: Achieve results with high rank in the exams with the most students selected and ranked at 1 level, with an average score of X = 3.10. As a result, we find that students learn for the score, not for building a long-term knowledge base. Meanwhile, the goal at level 2: Covering gaps in knowledge to adapt to training requirements is ranked last (with an average score of X = 1.9). Students need to have a good grasp of the knowledge, to ensure the output standards of the subject and this also shows that the students are interested in the requirements of the training major. Objectives at level 3: Practising self-discipline in studying and level 4: Fostering learning methods and skills to apply knowledge in life, ranked at 2nd and 4th, proving that students are focusing highly on learning goals. However, students also need to have a learning orientation to achieve the goal at level 5: Training the will and ability to learn for their whole life in the context of the Industrial Revolution 4.0 instead of studying to just "Achieve the best results in exams". That is, students pay less attention to learning to gain new knowledge than focusing on studying for the end of the subject.

Through exchanges and interviews with managers and lecturers, it is said that students should now set goals for developing skills, methods, and attitudes through studying Technical Drawing at the University of Technical Pedagogy by following self-directed learning.

**2.3.2. Students choose learning content**

The content of learning technical drawing subjects at the universities of Technology and Education includes Compulsory content for students majoring in engineering technology (basic content) and topics, including required and optional topics (Advanced content and Deep content). The results of surveying the level of learning content selected by the students are described in Table 4.

***Table 4. Level of learning content in technical drawing subject chosen by students***

| Level | Poor | | Average | | Good | | Very good | | $\overline{X}$ | Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| | Q.ty | % | Q.ty | % | Q.ty | % | Q.ty | % | | |
| 1 | 21 | 03.3 | 155 | 23.7 | 261 | 40.1 | 213 | 32.9 | 3.02 | 1 |
| 2 | 75 | 11.6 | 132 | 20.3 | 294 | 45.2 | 149 | 22.9 | 2.79 | 6 |
| 3 | 40 | 06.2 | 147 | 22.5 | 280 | 43.1 | 183 | 28.2 | 2.93 | 3 |
| 4 | 38 | 05.8 | 121 | 18.6 | 319 | 49.1 | 172 | 26.5 | 2.96 | 2 |
| 5 | 36 | 05.6 | 192 | 29.4 | 285 | 43.9 | 137 | 21.1 | 2.80 | 5 |
| 6 | 30 | 04.6 | 170 | 26.1 | 292 | 44.9 | 158 | 24.4 | 2.89 | 4 |

Level 1: The level of implementation of the learning content of the Technical Drawing subject according to the subject program.

Level 2: To what extent does the knowledge being studied meet the requirements of technical and engineering training?

Level 3: Learning content of technical drawing subject is based on "Combining both basic and advanced programs; specialized topics are compiled by teachers themselves".

Level 4: The knowledge being taught is based on "Combining both basic and advanced programs; in-depth topics compiled by teachers themselves".

Level 5: To what extent does the content of knowledge being taught have a reasonable ratio between theory and practice?

Level 6: To what extent has the subject content promoted self-study and self-research, and enhanced students' proactive study and creativity?

In general, the survey questionnaires all gave Good results with the content of teaching technical drawing. In which, at Level 1: The level of implementation of the learning content of the Technical Drawing subject according to the subject program is the most chosen by students and ranked at 1 level, with an average score of X = 3.02. In which, the number of votes selected at the Very Good level was 213 votes (32.9%); the Good level was 261 votes, 40.1%). The average was 155 votes (23.7%) and the Poor was 21 votes (3.3%).

The remaining levels of learning content are assessed in different levels. Particularly at Level 3: The learning content of technical drawing subject is based on "Combining both basic and advanced programs; specialized topics compiled by lecturers" which are selected and performed by students quite well, ranked at level 3, with an average score of X = 2.93. In which, the evaluation votes have similar rates at all levels, with 183 votes Very Good (28.2%); 280 votes Good (43.1%); 147 votes (22.5%) Average, and 40 votes (6.2%) Poor. The above results show that, despite the combination of basic, advanced to deep programs, the teaching content is at a good level compared to the requirements of the subject's learning objectives.

Regarding the knowledge being studied to meet the training level of the technology and engineering industry, the majority of the survey votes rated Good with 319 votes (49.1%). The level of content of the subject has promoted self-study, self-study at level 6 is done quite well, ranked 4th, with an average score of X = 2.89. In which, the Good level has 292 votes (44.9%); Very Good has 158 votes (24.4%), and Average and Poor has 200 votes (30.7%). Only at level 2: Learning knowledge that has met the training requirements of engineering technology is selected at level 6, with the lowest average score, with X = 2.79. In which, there were 132 votes (20.3%) at the average level and 75 votes at the poor level (11.6%).

From the above survey results, it is shown that, regarding the content of teaching technical drawing subjects in universities of Technology and Education in the direction of self-directed learning, it is necessary to further strengthen the implementation of criteria 3, 4, and 6 to achieve high efficiency in learning. That is, students should harmoniously combine basic content, advanced content, and in-depth; a reasonable combination of theory and practice to achieve learning goals.

Through interviews with managers and lecturers teaching technical drawing subjects and from the practice of universities of Technology and Education, it was found that the actual teaching knowledge is not enough to meet the training requirements of the major and international accreditation of training programs. Therefore, learning content is always updated, students should be active in learning, self-study, and self-study to develop new knowledge.

### 2.3.3. Students choose the form of learning

In the teaching process, it is necessary to have flexible and creative teaching forms, apply different teaching methods, apply information technology in teaching, help students be flexible in learning and achieve good results, and guide students to self-learning and self-research [14]. To have a rich and diverse teaching form, skillfully combining forms, lecturers organize learning activities with different forms, helping students to actively choose appropriate learning forms. The results of the survey on learning forms of technical drawing subjects in the direction of self-directed learning are described in Table 5.

***Table 5. Degree of students' choice of learning method***

| Form of learning | Poor | | Average | | Good | | Very good | | $\overline{X}$ | Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| | Q.ty | % | Q.ty | % | Q.ty | % | Q.ty | % | | |
| 1 | 06 | 00.9 | 185 | 28.5 | 371 | 57.1 | 088 | 13.5 | 2.81 | 2 |
| 2 | 21 | 03.3 | 117 | 18.0 | 411 | 63.1 | 101 | 15.6 | 2.91 | 1 |
| 3 | 73 | 11.2 | 273 | 42.1 | 233 | 35.9 | 071 | 10.8 | 2.46 | 4 |
| 4 | 78 | 12.0 | 161 | 24.8 | 330 | 50.7 | 081 | 12.5 | 2.63 | 3 |

Form 1: Learning by class; Form 2: Studying in groups; Form 3: Personal study; Form 4: Online learning.

The form of learning Technical Drawing subject at the Universities of Technology and Education is done by class unit, and the lecturers use a combination of different learning methods for students to actively identify and choose. However, according to the survey results, in Form 4: Online learning, the interaction between lecturers and students on subject content through the internet environment received low results of assessment, in 3rd rank with an average score of X = 2.63. In which, the average number of votes was 161 votes (24.8%), and the poor level was 78 votes (12.0%). This result shows that the form of learning technical drawing through the application of assistive technology applications is not high. This is a form of teaching organization that is currently very interesting to the educational community and is also a form of implementation that is quite effective, especially when the Covid-19 epidemic takes place around the world. This shows the fact that learning technical drawing subjects is mainly just learning in class.

Implementation of the curriculum content in the university is a necessary issue in the task of lecturers. Training by credit method in universities has changed much compared to training in the form of an annual system. Therefore, the role and position of the lecturers also change. For the self-directed learning method, the role of the lecturers has shifted from imparting to guiding, encouraging, and supporting students in the teaching method of technical drawing.

**2.3.4. Students choose learning methods**

Evaluation of the current status of learning methods of technical drawing subject of engineering technology students by self-directed learning. The results of the survey are described in Table 6.

***Table 6. Degree of students' choice of learning methods***

| Learning method | Poor | | Average | | Good | | Very good | | $\overline{X}$ | Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| | Q.ty | % | Q.ty | % | Q.ty | % | Q.ty | % | | |
| 1 | 06 | 0.9 | 191 | 29.5 | 372 | 57.1 | 081 | 12.5 | 2.80 | 3 |
| 2 | 05 | 0.8 | 214 | 32.8 | 319 | 49.2 | 112 | 17.2 | 2.82 | 2 |
| 3 | 00 | 0.0 | 034 | 5.2 | 369 | 56.7 | 247 | 38.1 | 3.33 | 1 |
| 4 | 40 | 6.2 | 198 | 30.5 | 300 | 46.1 | 112 | 17.2 | 2.74 | 4 |

Method 1: Learn from the teacher in class.

Method 2: Learning by visual observation.

Method 3: Learning from experiential activities.

Method 4: Self-study in groups and do learning projects.

The survey results show that the majority of students choose the experiential learning method, with an average score of 2.91, ranked 1st. Therefore, this method of learning is implemented by students very often and often when studying Technical Drawing. In addition, the learning method through visual observation was chosen by the students with an average score of 2.82, ranked 2nd, and the learning method according to the teacher teaching in the class was ranked 3rd [15] and students rated good and very good in teaching technical drawing subject.

**2.3.5. Self-directed learning capacity of students**

The summary of survey results, and capacity of assessment of self-directed learning of students when studying Technical Drawing subject is described in Table 7.

***Table 7. Summary of learning situation in Technical Drawing subject to self-directed learning***

| Content of the survey | Poor | | Average | | Good | | Very good | | $\overline{X}$ | Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| | Q.ty | % | Q.ty | % | Q.ty | % | Q.ty | % | | |
| 1 | 186 | 28.6 | 215 | 28.0 | 97 | 19.9 | 152 | 23.5 | 2.32 | 4 |
| 2 | 040 | 06.2 | 153 | 23.5 | 288 | 44.4 | 169 | 25.9 | 2.90 | 2 |
| 3 | 045 | 06.9 | 184 | 28.3 | 336 | 51.7 | 085 | 13.1 | 2.70 | 3 |
| 4 | 018 | 02.8 | 178 | 27.7 | 352 | 53.9 | 102 | 15.6 | 2.92 | 1 |

Content 1: Students determine learning goals.

Content 2: Students choose learning content.

Content 3: Students choose the form of study.

Content 4: Students choose learning methods.

*Content 1: Students determine their learning goals, based* on the combined results in Table 7 shows that most of the surveyed students have not identified and implemented their learning goals well, with an average score of X = 2.32, ranked 4th. Which, Good had 97 votes (19.9%), Very Good had 152 votes (23.5%), Average had 215 votes (28.0%) and Poor level had 186 votes (28.6%). The results show that students still have many difficulties in self-determining their learning goals to self-direct the learning process for themselves.

*Content 2: Students choose learning content*, according to the survey results described in Table 7, students perform well in choosing learning content by themselves, ranked 2nd, with an average score of X = 2.90. In which, the number of votes for the very good level was 169 (25.5%) and the number of votes for the Good level was 288 (44.4%). This result shows that students actively choose learning content according to their abilities, needs, and identified learning goals.

*Content 3: Students choose the form of learning,* the majority of students choose the form of learning in the whole class and groups. The survey results show that students are very active in choosing a form of learning that suits their needs and learning conditions, with an average score of X = 2.70, ranked 3rd, in which 336 votes (51.7%) Good. This result also shows that students are interested in the form of learning by the selected content and learning objectives.

*Content 4: Students choose learning methods,* according to the survey results described in Table 7, most students actively choose learning methods that are suitable to the content and learning objectives, ranked first, with an average score of X = 2.92. This result also shows that students are very active in choosing learning methods and processes that are suitable for their learning conditions, once they have identified their learning goals, content, and form practice.

**2.3.6. Discussion**

Currently, the majority of students still carry the "exam" factor in determining their learning goals, not paying attention to the goal of developing the necessary competencies to meet social requirements. Therefore, in teaching, teachers need to guide students to develop social competencies in addition to professional competencies through each subject in the training program. Meanwhile, students actively choose learning content according to their ability and learning goals. However, the learning content is mainly exploited from the textbook, not actively researching from many different sources to improve professional knowledge of the subject. Most students actively choose the form, process, and learning method that are suitable for their learning conditions, when the learning objectives and content have been determined. This shows that students are capable of self-directed learning and can fully apply self-directed learning in today's learning.

Learners' expressions and interest in self-directed learning are similar to engineering courses. This study compared with similar studies on self-directed learning in engineering courses. The studies also show the necessity of self-directed learning for engineering students. In specially, Stewart, R. A. (2007), concluded that graduating students with heightened self-directed learning aptitude is one of the best outcomes an engineering education provider can offer the professional employment market [16].

## 3. Conclusions

In the context of increasing knowledge, the needs of learners are increasingly diverse, and trends in lifelong learning that are interested in, students' ability to self-study and self-direct their learning activities are very important. Through the survey results about students' ability to identify goals, and choose learning content, forms, and learning methods when studying Technical Drawing at universities of Technology and Education, it can be seen that students are still heavily focused on exam goals in learning, and have not actively expanded learning content outside the universities' curriculum and textbook. However, the ability of students to self-select forms, processes, and learning methods is good, meeting the requirements of self-directed learning and lifelong learning for students.

The survey results, analysis, and assessment of the above situation show that, in the current context and students' self-directed learning capacity, lecturers can completely apply self-directed learning in teaching.

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