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Self-Competence of Online Technologies and Academic Resilience among STEM and Ordinary Programs Students at the Faculty of Education - Zagazig University

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Abstract

This study aims to explore the differences among STEM students and ordinary programs students concerning both self-competence of online technologies and academic resilience. In addition, it focuses on revealing the relationship between self-competence of online technologies and academic resilience for Sophomores of programs (STEM) and ordinary programs in faculty education. The sample included 92 second-level students: 41 enrolled in STEM program and 51 students enrolled in ordinary programs at the Faculty of Education, Zagazig University. Self-competence of online technologies scale and academic resilience questionnaire were administered. The independent sample t-test and Pearson correlation coefficient were calculated. Results of the study demonstrated a statistically positive correlation at the level of (0.01) between self-competence of online technologies (total score) and its dimensions with academic resilience (total score) and its dimensions. In addition, there are statistical differences between students of STEM programs and ordinary programs at the faculty of education in the self-competence to electronic knowledge, evaluation self-efficiency, and electronic self-efficiency in favor of the students of the second level with STEM programs. There are also statistical significance differences between both groups in academic resilience (total degree) in favor of students of the second level of STEM programs.

Keywords

Self-competence of online technologies - academic resilience- STEM

Introduction

The Education in Strategic Vision for Egypt to the Year (2030) provides for "high-quality education and training for all without discrimination or within an institutionalized system that is efficient, fair, sustainable and flexible. It is based on a learner and trainer who can think, technically, technologically capable, and also contribute to building the integrated personality and unlocking its potential to the maximum extent".

Students in today's world must therefore have a scientific view, freedom of thought, and perseverance at work to enable them to prepare themselves with the weapons of science.

On the other hand, the constant changes and rapid progress of human information require that education systems do their best to address and persevere on this issue. They demonstrate academic resilience, decision-making, and judgment on various matters.

The final product of education is the development of students' exploratory minds, self-concept, and self-confidence, through awareness of information, its perception, acquisition, evaluation, and transformation into new knowledge in line with the age of technology. In the framework of universities' orientation to achieve digital transformation at all levels and contribute to the provision of scientific material to students online through the platforms of various universities to ensure the preservation of the parties of the educational system.

The student's confidence in his/her self-competence of online technologies also enhances his personal, social, and professional adaptation, pushing him to hope and use flexible, meditative practices that help him successfully pass difficult tasks. If general self-competence has won attention from scientific research with students and teachers by researchers, but online technologies self–competence still needs more study.

Puzziferro (2008, p.7) argues that Self-competence of online technologies express students' levels of confidence in technologies that require to interact and engage in online learning, such as online navigation, uploading and downloading files

So self-competence in online technologies is important in understanding online learning, while students have confidence in their computer skills, they perform better in learning. Today, technology enters into all aspects of life, this is reflected in technological self-competence (McCoy, 2010, p.1614).

Johnson and Lockie (2018, p.16) argue that education continues to shift the traditional learning to online learning, and educational leaders must take care of the institutions that offer quality and effective programs for students, so teachers need to be aware of this - online education presents different challenges for both teachers and students.

Therefore, the challenge associated with online education technology is the self-competence of online technologies and the academic resilience of learners, especially in light of the changes in the teaching process from the replacement of paper books with electronic books.

Garvis and Tekin (2016, p.82) added that learning process design in the teaching environment affects the process of increasing the self-competence of students, preparation for simulation as an instruction environment to be a social method that includes working with students' progress, As well as tacking and giving feedback in an organized style, which may enhance the self-competence.

The philosophy of STEM (Schools) for science, technology, engineering, and mathematics education is to build an education that contributes to the advancement of the economy and sustainable development through the development of advanced educational curricula that focus on the basic skills and talent development of students targeted education outcomes are aligned with

the labor market, which is what the Schools (STEM) philosophy aims to do ،It was necessary to take this trend in building curricula and teacher preparation programs that emphasize the transformation of pure scientific material to the integration of science, technology, engineering, and mathematics. Applying them in the major challenging fields in Egyptian society. In this context, the programs to prepare outstanding school teachers in science and technology (STEM) in the first university degree through continuous cooperation between Egyptian and American universities in the project (STESSA) between the universities (Asyut , Ain Shams, Mansoura, Zagazig and Minya) and seven American universities are (California State University: Bakersfield, California State University: Fresno, California Polytechnic State University (Cal Poly), Drexel University, Temencetti, Umbrella, Arcadia University) with USAID funding to prepare specialist teachers to teach the students of Egypt's top science, math and technology schools (List of STEM programs, 2020, p. 4).

When the researcher teaches in STEM programs, I know that teaching in the STEM programs in the faculty of education involves system projects, research, surveys, discovery, and questions by the student to use the information and skills acquired in designing projects to serve the environment. The students connect to real problems, to be able to face the major challenges in Egypt efficiently and provide creative solutions to various problems, this requires academic resilience.

Cassidy (2016, p.2) noted that Academic Resilience is primarily concerned with resilience in educational and academic context. Academic Resilience is the ability to face acute and difficult situations then succeed in solving these situations.

Hence, the student must have the motivation to achieve academic success and face the pressing academic events inside the Faculty of Education and outside it, so as not to be students at risk and academic failure.

Rajan et al. (2017, p.507) define Academic resilience as continuing education despite adverse conditions such as widespread domestic violence, school dropouts, poverty, many other factors, social and emotional problems, such as parental separation, imprisonment, and drug use.

Hurley and Young (2022) define resilience as having the mental, emotional, & behavioral flexibility and ability to adjust with both internal and external demands. it comes to one challenge you're faced with, but struggle more with being resilient when it comes to another stressor you're up against.

So It can be said that resilience includes several approaches, such as academic resilience, in which the student is a constant success despite exposure to difficult situations, difficulties, and obstacles that may hinder his progress. The ability to regain psychological balance after exposure to academic difficulties; the student may take these difficulties as a challenge and continue to persevere to achieve academic success and academic excellence.

The current study problem stemmed from the realization of the importance of the research sample: the students of the programs (STEM) and the ordinary programs of the faculties of education who are qualified to teach the students of the outstanding schools of science & technology (STEM), government and official schools located in various Governorates of Egypt.

Research problem

It is clear that there is a lack of research that has shown a theoretical relation between self-competence of online technologies and academic resilience. No one has this research addressed these variables in students of STEM programs and ordinary programs in faculty education, which is one of the latest programs in faculty education. It is what will be addressed which may represent a new addition that enriches the current research.

Hence, Study questions can therefore be formulated in the following points :

1. Does the Self-competence of online technologies vary according to the types of programs (STEM, Ordinary) at Faculty Education- Zagazig University?
2. Does academic resilience vary according to the type of programs (STEM, Ordinary) at Faculty Education- Zagazig University?
3. What is the relation between self-competence of online technologies and academic resilience in the current study sample at the Faculty of Education, Zagazig University?

Study Purposes: the current study aims to discuss the differences between the students of the programs of Faculty Education (STEM, ordinary) at Zagazig University in both self-competence of online technologies and academic resilience. Revealing the existence of statistically significant relations between Self-competence of online technologies and academic resilience in the current study sample at Faculty Education- Zagazig University.

Importance of Study: The importance of the current study lies in: that it addresses important and effective variables (Self-competence of online technologies, and academic resilience) in the process of student learning and helps him\her excellence. In addition to dealing with a sample of students of the programs (STEM) and ordinary in the Faculty of Education which are future teachers qualified teaching to students of outstanding schools of science & technology (STEM) , government and official schools. It is also concerned with drawing the attention of those involved in the educational process to the effective importance of academic resilience and self-competence of online technologies in active learning and taking into account in the educational curricula to contribute in the development of the educational process.

Theoretical framework

Self-competence

The self-competence concept is a result of the collected work of Rotter (1966) and Bandura (1977). It refers to people generally developing expectations about their ability to control their environment, first from a general sense of internal control to the feeling that control is external by a big degree, these predictions about how far one can affect the results, events that build his own life are referred to as the locus of control theory (Pendergast and Main, 2016, p.105). While Stajkovic and Luthans (2003, Pp.127-128) discuss the concept of self-competence as a psychological construct that deals specifically with a person's beliefs in his abilities to influence the classroom and produce desired results through their tasks. There are threefold effects between the person, the environment and the behavior.

Bandura (1997, p.35) defines self-competence as an individual's expectations or beliefs of being able to learn or perform works at different stages, and other authors have attempted to identify self-competence, but they are all reformulated to refer to Bandura's definition.

Stajkovic and Luthans (2003, p.130) said that self-competence is a person's belief in their ability to deal with a specific task in the context. As a work-motivated process, self-competence determines how an individual's work behavior will be initiated, how much-exerted work, and how long action will last. Then highly self-efficient people will be characterized by sufficient effort activation, but Individuals with low self-competence will stop their efforts prematurely and will fail in the task. Also, Scherbaum et al. (2006, p. 1047) define General self-competence, as the belief of individuals for their ability to perform a variety of tasks in different situations and different contexts well.

Accordingly, Self-competence is an individual's belief in his ability to perform specific work and consists of three components: size, strength, & generality: size expresses the degree of difficulty task that a person believes who can achieve. Strength: is the degree of confidence that students have reached a certain level of difficulty. Generality: is the extent to which this is generalized across different situations, the high level of self-competence enables individuals to continue in difficult situations, Looking at difficulty as a challenge, viewing failure as evidence of the need to increase effort, attributing success to efficiency, self-regulation in process adaptive learning styles and study skills may to be used effectively by individuals with a high degree of self-competence (Pendergast and Main, 2016, p.112).

Bandura (1997, pp.36-37) added that effectiveness is not a standard static ability that individuals possess or do not possess in their behavioral lists; instead ‹Being effective in dealing

with the environment implies a productive capacity where social, cognitive, emotional and behavioral sub-skills must be organized into integrated work streams to help on achieving a lot of aims.

Therefore, Self-competence is personal beliefs about the ability to achieve results and the desired level of performance. These beliefs determine how people feel, think, motivate themselves, and behave. Self-competence depends on both the level of achievement and the strength of faith to reach this level, These beliefs reinforce the method for individuals to finish tasks and highly self-efficient people take on challenging tasks such as challenges to master compared to low self-competence who regard tasks as threats to be avoided from what they do Leads to low expectations and weak commitments (Seo and Moon, 2013, P.363).

These diverse effects of self-competence beliefs are produced by four key psychological processes: (a) perception (thinking processes to benefit information to build new choices, integration of predictive factors, testing & review of judgments, and remembering the influence of used factors); (b) motivation in (choose tasks, intense, perseverance with causal attribution, expectations of results, choose cognitive knowledge); (c) emotional (adapting abilities and feeling reactions that occur in difficult situations); (d) election processes (selection for personal development and the environment) (Seo,2016, pp.59- 60).

Bandura (1997, p.43) also referred to the generality of self-competence as the degree to which success or failure in handling tasks in similar situations or contexts affects. Individuals have Self-competence beliefs in different domains, and within the network of beliefs of effectiveness, some are more important than others; generality includes the variety of tasks or methods in which people find themselves effective: "Generality can change across the kinds of activities, the ways in which

abilities (behavioral, cognitive, and emotional) are expressed, situational differences, and the kinds of individuals who expose to this desired behavior"

The researcher will be interested in dealing with self-competence of online technologies to see how different ways of expressing the individual abilities possessed cognitive, and academic. The role of education as a comprehensive development process for all aspects, especially for undergraduate students, so the researcher builds a questionnaire of self-competence of online technologies in various fields (self-competence to electronic knowledge, evaluation self-competence, and electronic self-competence.

In light of what Berg and Smith (2016, p.3) referred That self-competence beliefs are that people carry their skills and competencies to achieve a specific task, these beliefs affect both the thinking styles, emotions, and motivation of the people, who can succeed more to persist in facing difficulties, and doing their best work to achieve desired goals for them, while people who doubt their skills and competencies may be too lazy and recognize that the efforts they made aren't useful.

Social cognitive theory adds that there are five basic human capacities: (1) coding, (2) reasoning, (3) indirect learning, (4) self-regulation, and (5) self-reflection. It is used by individuals to influence them to initiate, regulate, and maintain their behavior (Stajkovic, and Luthans, 2003, p.129)

It is clear from the above that the benefit of self-competence beliefs increases in maintaining the effectiveness of student performance in periods when the educational process is undergoing various transformations, such as the shift towards the use of active learning strategies, and multimedia technology, e-learning, especially at the university level. Such large shifts in the

education system are usually accompanied by a kind of complete lack of clarity of vision among teachers, and challenges that require teachers to be highly adaptable and able to cope with such conditions. Busch (1995, p.147) sees computerized self-competence as a special kind of (general self-competence) and defines it as "a person's belief in their ability to use a computer. People with low confidence in their ability to use a computer can perform more poorly on computer-based tasks. Miss and Bokoh (2021, p.1) said that computerized self-competence is an important component that is considered in terms of the use of electronic resources in the learning process based on computers.

Therefore, the researcher defines Self-competence of online technologies as the beliefs of the individual and his/her perceptions about his/her ability to use and apply various computer applications then improve his/her performance and tasks through the acquisition of a set of knowledge, information, and skills (electronic, Technology and the use of technological means in its practical practices. Measured by the degree obtained by the student in the scale of Self-competence of online technologies (preparation of the researcher)

1. Self-competence to electronic knowledge: The student’s belief in possessing the academic information and knowledge necessary to facilitate the learning process and the requirements of E-learning.
2. Evaluation of self-competence: The student’s belief in his/her possibilities to use and apply Internet-based programs and applications to evaluate his/her learning and provide feedback in light of the requirements of electronic learning.
3. Electronic self-competence: The student’s belief in his/her possibilities to use and employ Internet-based programs and applications to facilitate the learning process and the requirements of e-learning.

Academic Resilience

Resilience is the ability to survive and continue despite difficult life situations while Academic resilience explains the reason for the higher academic performance of some students and not others, then achieving academic success despite their exposure to negative situations (Mirza and Arif, 2018, p.34) & (Cassidy, 2016, p.1) says that Resilience is a psychological concept observed in some people who achieve success in difficult situations. Then Resilience reflects the ability to come back, Academic resilience contextualizes of resilience construct and reflects the increased likelihood of educational success in difficult situations.

Kamath (2015, p.414) and Sabir, et al. (2018, p.55) referred to resilience as a person's ability to deal with positively to stress and negative situations, then have the ability to return after exposure to adverse events in a good manner, these traits are important to help an individual effectively overcome the stresses in their life. Therefore, Schwartz (2018, p.99) saw resilience as the ability to adapt and resist stress. Helping students on continuing to succeed in times of stress, recover, and stay calm when facing difficulties and solving problems. However, Mirza and Aref (2018, p.36) saw that academic resilience is a skill that can be taught by students as each student can learn, improve, enhance themselves over time alongside family and teachers and provide supportive conditions that foster academic resilience, especially with students at academic risk. INisa et al. (2023, p.80) add that Academic resilience is a person's ability to adapt to his life after exposing instructional difficulties. While Tamannaeifar and Ghohroodiaim (2023, p.39) define academic buoyancy (index of academic resilience) as a field of the basic concepts in positive psychology that is important in the successful and active learning for students. Academic buoyancy

refers to a learner's personal capacity to positively deal with academic challenges and general comebacks in daily school life.

So Academic resilience has been identified as an indicator of recovery from an individual's difficulties and a distinctive trait of the Productive Personality that improves one's adaptation and control of external factors. A person may tend to be Optimistic in all situations even under stress, being more optimistic in handling situations and realizing their abilities to deal with them (Zahra and Riaz, 2017, p.23). Also, academically resilient students have the ability to use coping strategies to adapt with stressful situations, socialize well with others, be able to self-control, have a good self-image, and be optimistic. Finally, Academic resilience is positively associated with mental and physical health (Benada and Chowdhury, 2017, p.105). This does not mean that a student who is characterized by academic resilience does not suffer from the pressures of life. But it may be affected by the stresses that arise from the surrounding environment temporarily then restore its balance and compatibility again quickly without affecting his psychological state, health, and behavior.

Academic resilience results from individual perceptions that integrate with stress in the environment to check individuals' adaptive skills, including a person's expectation of himself, person's abilities, and good relations with the environment around one's self. These beliefs may be influenced by personal & environmental variables, socio-economic factors, growth, experience and family income (Rajan et al., 2017, p.507).

Koholic et al. (2012, p. 834) introduce four elements that may contribute to improving individual academic resilience: increasing academic self-competence, moving away from risks,

discovering new and different opportunities. Positive changes associated with the personal, social, family, and academic fields.

Improving academic resilience depends on the cooperation between students, their environments, experiences enhanced by culture, ideas, practices, and activities, therefore using adaptation and coping strategies (Rajan et al., 2017, p.507). So the educational institution and teachers should play a role in minimizing a student's feeling of failure. The teacher can enhance the characteristics of academic resilience among students at academic risk by providing them with protective factors that contribute to raising their academic resilience, such as Self-confidence, self-esteem, self-competence, optimism, independence, humor, emotion control, inclusion in educational activities, and the warm, open relationship between student and teacher (Mirza and Ariff, 2018, p.45).

Schwartz (2018, p.102) also noted that academic resilience can be enhanced by three things: Informational through increased awareness, knowledge, and develop Self-Regulation Skills by translating fears into effective habits. Building a strong sense of effectiveness by providing individuals with repeat opportunities for guided practice in the application of the skills taught, Creating social support by finding connections between the individual and the environment.

The researcher concludes from the above that academic resilience includes the interaction of the student with the surrounding environment, which are called protective factors that may be internal or external. Since internal factors is specific to the student such as The students' perceptions of their academic level, their ability to deal with negative and stressful events and situations, their level of ambition, motivation, optimism, hope, perseverance, readiness, self-

organization and flexibility in dealing with situations in addition to the state of health. External factors are specific to the environment, such as the types of support received by the student from others, parental & peer expectations, expectations of the teacher and participation in educational activities both inside and outside the educational institution. All this determines the degree of self-confidence for the leaner and degree of academic resilience in coping with difficulties.

Hence, Mohatashami, et al. (2015) said that Resilience is defined as the capability of adapting to menacing situations and hardiness refers to one of the personality traits that moderates the manner of dealing with stressful factors.

There are many scales that measured resilience in general, most notably the Connor and Davidson scale (2003), which are spread across five dimensions: personal competence, self-confidence, positive receptivity, Spiritual Influence and Religious Influence. There are also a number of scales that have addressed academic resilience and its components, for example: Martin and Marsh Scale (2006), a one-dimensional measure, consisting of (6) items that measure how students are able to cope with challenges and difficulties in academic preparation, such as dealing with school stress, self-confidence when dealing with setbacks, poor school ratings and negative feedback. The Kapikiran Scale (2012) is a one-dimensional scale consisting of (6) items which measures the ability of the Turkish high school students to succeed in their classroom despite the difficulties, unexpected academic conditions and attitudes. The Cassidy Scale (2016) is a multi-dimensional scale, consisting of (30) item scales spread across three dimensions: Perseverance, Reflecting and adaptive help-seeking , Negative affect and emotional reaction, The researcher adopted this questionnaire to estimate academic resilience in current study given its novelty, because it is a multidimensional measure as it consists of three dimensions and has good psychometric properties.

Then, Cassidy (2016, p.2) said Academic Resilience is the ability to coexist with adversity and acute difficult situations that represent a big threat to a learner's progress in instructional programs and to evaluate the students through their use of methods in which their academic performance and degrees can be improved. It is known procedurally as Student grade obtains on the academic resilience scale, which consists of three dimensions:

1. Perseverance: It includes working hard, trying, continuing despite difficult situations, not giving up, adhering to goals and plans, benefiting of observation and accepting feedback, and facing challenges
2. Reflection and adaptation to seek help: This includes thinking about strengths and weaknesses, asking for support and encouragement, changing study methods, evaluating tasks and achievements, managing positive reinforcement and managing punishments.
3. Negative influences and emotional reaction: represented by anxiety, despair, and acceptance of negative influences

The relationship between the variables:

Ahmad and safari,(2013) studied how self-competence developed and the method it influences students' academic performance (index of academic resilience) in addition to social interaction with peers, then applied the scale of self-competence to 15 students of the 5th grade of a local school. And analyzed the content of interviewees' responses that showed students with high self-competence planned to study difficult subjects in the future. There are positive relations between Self-Competence and Students' Academic performance (index of academic resilience).

Honicke and Broadbent(2015) collected 12 years of study on the relationship between academic self-competence and university students' academic performance (index of academic resilience), the result indicate that: there is a positive relation between Academic self-competence and academic performance(index of academic resilience).

Ozerbas and Erdogan (2016) aimed to know the effect of digital classroom technologies on academic success (index of academic resilience) and online technologies self-competence for 7th grade students. There is an experimental study and another control group with a pre-test/post-test for both. The results of this study have indicated that there is a statistically significant difference between two groups in academic success in favor of the experimental group. However, it has been shown that there is no statistically significant difference in students' online technologies self-competence.

Aldhahi et al. (2021) explored academic self-competence in online learning and know the determinant factors of persons' academic self-competence. The sample consisted of 892 people who voluntarily participated in and completed the survey. Online learning self-competence was measured using an online academic self-competence questionnaire revealing that 85% of the people were female, 21% were medical learners, and 13% were postgraduate learners. The results showed that academic performance (index of academic resilience), and learning satisfaction were significant predictors of self-competence for time management ($p < 0.001$). Self-competence can play a major role in online learning,

Sujiarto et al. (2022) analyzed the influence of self-competence on student academic resilience in the Depok City area. And uses a quantitative style with survey methods and path analysis approaches. The population is all students studying in Depok City with a sample of 410

students taken by random sampling. The results showed that the direct effect of self-competence on academic resilience is (0.518), so this coefficient value is satisfied.

Usán et al. (2022) comprised 2652 students from secondary schools in Zaragoza, Aragón, Spain. They used the Academic Self-competence Scale (ASES) and the Brief Resilience Scale (BRS); average marks were used to measure academic performance. The results of the study revealed a significant relationship between self-competence, resilience, and academic performance (index of academic resilience). Self-competence was found to play a mediating role between resilience and academic performance (index of academic resilience).

Yinka et al. (2022) studied the effect of resilience and self-competence on the academic performance (index of academic resilience) of people in Nigeria. The study utilized a quantitative method using both survey and cross-sectional study designs. A sample of (345) people was applied to run the measurement and structural models, A self-administered questionnaire was used to collect responses from the people using a stratified random sampling technique. The study found that resilience and self-competence have positive & significant effects on students' academic performance (index of academic resilience).

Abdolrezapour et al. (2023) investigated the relationship between students' self-competence, resilience, and academic motivation in online instruction. A sample consisting of 120 university students coming from two state universities in the south of Iran participated in an online survey. The questionnaires used in the survey included the self-competence questionnaire, resilience questionnaire, and academic motivation questionnaire. Pearson correlation and multiple regression were applied to analyze the obtained data. The results revealed a positive relation between self-

competence and academic motivation (index of academic resilience). Those with higher levels of resilience were found to experience higher academic motivation.

DelRosario, et al. (2023) seek the relationship between self-competence and resilience among 150 first-year college students. And used a correlational method. Thus, the General Self-Competence Scale and Resilience Scale were utilized to measure the variables. Furthermore, the statistical analysis reveals that the correlation coefficient of 0.48 indicates a low positive relation between the variables. Hence, a significant relationship exists between self-competence and resilience among first-year college students.

INisa, et al. (2023) try to prove the effects of self-competence and academic engagement on academic resilience. It used a correlational method and involved 280 university students who were writing final projects. Results revealed that self-competence affected the students' academic resilience improvement. Thus, self-competence and academic engagement are discussed to support the development of students' academic resilience.

Methodology

The study comprised 92 students at Faculty Education in Zagazig University with ages ranging from 18 to 20 years (M=19.78; SD=0.589).

1. Self-competence of online technologies Scale for Program Students (STEM) and Ordinary Programs at Faculty Education- Zagazig University (Prepared by the researcher).

The researcher prepared this scale after looking at the theoretical framework and previous scales on the self-competence variable including a study like the Miltiadou and Yu(2000), Cassidy

and Eachus(2003), Puzziferro (2008), Ferla, et al.(2010) & Bandura (2012), which includes a range of questions about each dimension of perceived self-competence ،So the researcher identified three dimensions (self-competence to electronic knowledge – evaluation self-competence – electronic self-competence) ،But all the phrases of the scale were formulated positively and the number of (18) items in its initial form to suit the students of the Faculty of Education - Zagazig University and was responded to according to the Likert scale in positive direction (very much –Largely - moderately–small degree –seldom) These responses were given scores (5 - 4 – 3 – 2 -1). These items are divided into three dimensions of the scale and each dimension contains (6) items. Therefore lower on the scale is (18) and (90) indicates higher self-competence of online technologies. The scale was applied in its initial application to the Psychometric sample (41) students from Faculty Education - Zagazig University. To calculate some of the psychometric properties (validity and reliability) of the self-competence of online technologies scale, the following actions have been taken:

a. Calculating the validity of the self-competence of online technologies scale :

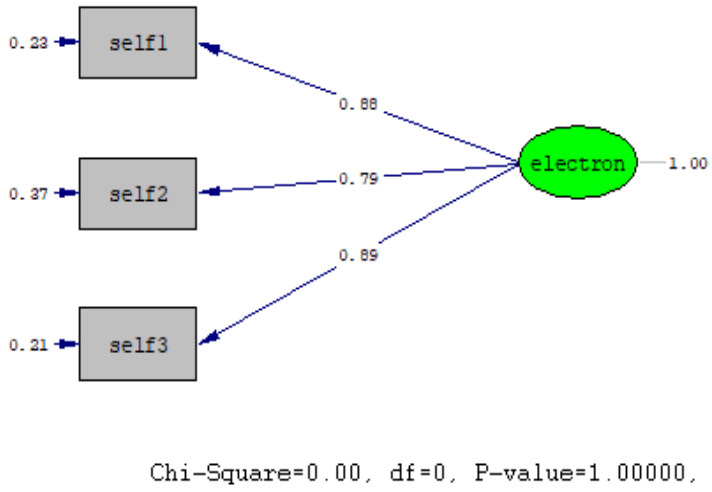
The first method: validity of the items: the scale (in its form after the arbitration) was applied to the random sample of (41) students. By calculating the correlation coefficient between the item degree and the total degree of its dimension (with the deleting the item degree of the total degree of its dimension). All correlation coefficients were a statistical significance at (0.01, 0.05) confined between (0.427 : 0.772), and this shows a validity (18) items.

The second method: the confirmatory factor validity of the self-competence of online technologies scale was calculated by using the Lisrel (8.8) program on the matrix of correlation coefficients between the dimensions of self-competence online technologies scale by testing the

latent factor model, where all the observed factors of the self-competence of online technologies scale were assumed to be organized around one latent factor and the results were as in Figure (1):

Figure 1

The planning path of the model confirmatory factor analysis of self-competence of online technologies



It is clear from the previous figure(1) that the value of chi-square is equal (zero) and has no statistical significance indicating good model data matching then the model has good matching indicators. Table No. (1) Shows the results of confirmatory factor analysis at the dimensions of self-competence of online technologies scale and its dimensions

Table 1

The confirmatory factor analysis results at the dimensions of the self–competence online technologies scale, t-test value and standard error

Dimensions of the self–competence online technologies scale	Saturated with a latent factor	Standard error	T-test	Validity factor	Sig. Level
Self-competence with electronic knowledge	0،879	0،099	8،840	0،773	،01
evaluation self-efficiency	0،794	0،103	7،670	0،630	،01
electronic self-efficiency	0،887	0،099	8،950	0،787	،01

It is clear from the previous table (1) that the three validity coefficients have a statistical significance at the level (0.01), which shows the validity of all dimensions of the scale. It is noted that the third factor (electronic self-competence) is the best predictor of the latent variable (self-competence of online technologies) where the coefficient of validity or saturation with the latent factor is equal to 0.887. The findings of the confirmatory factor analysis provided strong evidence of the validity of latent construction of the self-competence of online technologies scale, an item latent factor around which the three sub-factors viewed are organized.

b. Calculation of the reliability scale:

The reliability scale was calculated through the following:

The reliability scale was calculated by using the coefficient of Alpha Cronbach for the items of each dimension separately and in the case of deleting the degree of the item from the total degree of its dimension. It is clear that the alpha coefficient for each sub-scale is less than or equal to the overall alpha coefficient for its dimension and the values of the alpha coefficient confined between (0.793 : 0.853) in self-competence to electronic knowledge, (0.764 : 0.808) in the evaluation self-

competence dimension, and (0.821 : 0.864) in the electronic self- competence. That is, all items are reliable and the alpha coefficient of the items in three dimensions (self-competence to electronic knowledge, evaluation self-competence and electronic self-competence) became (0.853, 0.808, 0.864) respectively. The reliability of the self-competence of online technologies scale as a whole was (0.930).

The previous procedures show the validity self-competence of online technologies scale in its final form of (18) items.

2. Academic Resilience Scale (Cassidy, 2016)

The Cassidy's Academic Resilience scale (2016) is designed to measure the responses and reactions of students of the College of Education when they experience certain academic difficulties and obstacles in educational contexts. Students respond by fifth Likert degree in a positive direction and this scale consists of (30) items over three dimensions: Perseverance consists of (14)items (1-2-3-4-5-8-9-10-11-13-15-16-17-30), Adaptive help-seeking reflecting consists of (9) items(18-20-21-22-24-25-26-27-29), and “Negative affect and emotional response” is a reverse dimension of resilience which consists of (7) items(6-7-12-14-19-23-28). This scale has been applied to (352) students of the Faculty of Education in a foreign environment which has enjoyed good validity and reliability coefficients.

To calculate some of the psychometric characteristics of the academic resilience scale on the Egyptian sample, the following actions have been taken:

a. Calculation of the validity of the academic resilience scale

- ***Validity items***

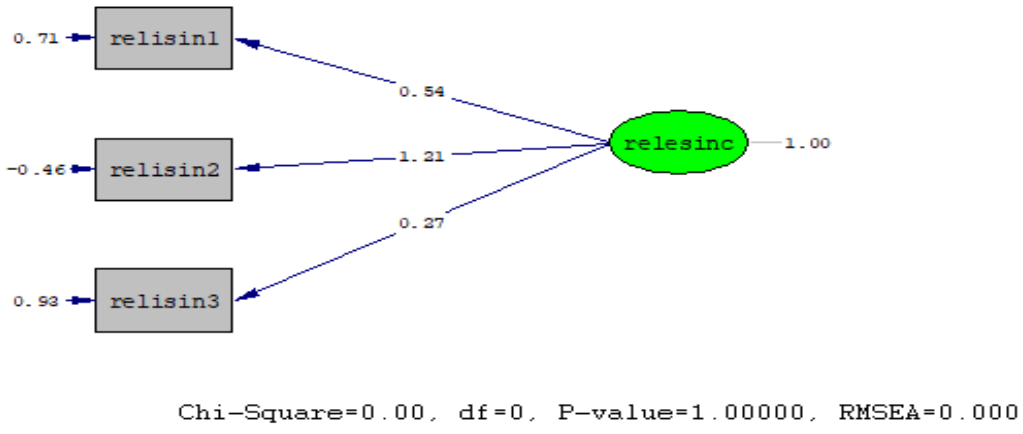
The scale (in its form after the arbitration) was applied to the random sample of (41) students by calculating the correlation coefficient between the item degree and the total degree of its dimension (deleting the item degree of the total degree of its dimension). All correlation coefficients were statistically significant at (0.01, 0.05) counted between (0.150: 0.590), except for item (15) in factor perseverance, and this shows the validity (28) items

- ***The confirmatory factor validity of the academic resilience scale***

By using the Lisrel program was calculated the confirmatory factor analysis of the matrix correlation coefficients between the dimensions of the academic resilience scale was by testing the latent factor model where all the observed factors of the academic resilience scale were assumed to be organized around one latent factor and the results were as in Figure (2).

Figure 2

The planning path of the confirmatory factor analysis of the academic resilience scale



It is clear from the previous figure(2)that the value of chi-square is equal (zero) and is not statistically significant indicating good model data matching, then the model has good matching indicators. Table No. (2) shows the results of the confirmatory factor analysis of the dimensions of the academic resilience scale and its dimensions.

Table 2

Confirmatory factor analysis results for dimensions of the academic resilience scale, t-test value and standard error

Dimensions of the academic resilience scale	Saturated with a latent factor	standard error	t-test	Validity factor	Sig.level
Perseverance	0،789	0،102	7،763	0،622	،01
Adaptive help-seeking reflecting	0،930	0،093	9،927	0،866	،01
Negative affect and emotional response	0،927	0،094	9،861	0،858	،01

It is clear from the previous table (2) that the three validity coefficients have a statistical significance at the level (0.01), which shows the validity of all dimensions of the scale. It is noted that the second-factor variable (reflection and adaptation to seek help) is the best predictor of the latent variable (academic resilience) where the coefficient of its validity is equal to (0.930). The findings of confirmatory factor analysis provided strong evidence of the validity of the latent construction of the Academic Resilience Scale.

b. Calculation of the reliability of the scale:

The reliability items of the academic resilience scale are calculated by using the coefficient Alpha Cronbach: the reliability items of the scale were calculated by calculating the alpha

coefficient of Cronbach for the items of each dimension separately and in the case of deleting the degree of item from the total degree of its dimension. It is clear from the Alpha coefficient for each sub-scale is less than or equal to the general alpha coefficient for the dimension in the case of all the items, Alpha coefficient values (confined between (0.437 : 0.606) except the item(15,α=0.616)in factor Perseverance between (0.654 : 0.701) except for the item (25, α=0.770) in factor Adaptive help-seeking reflecting and between (0.371 : 0.575)in factor Negative affect and emotional response, that is, all the items reliable, except for the two items (15,25). Therefore, these items have been deleted. By recalculating the alpha coefficient for Perseverance, Adaptive help-seeking reflecting and Negative affect are (0.616, 0.770, 0.575) respectively. The reliability of the academic resilience scale as a whole was calculated (0.930). The previous procedures show the validity of the academic resilience scale in its final form of (28) items.

Results

Verification of data distribution moderation: Prior to testing and discussing hypotheses, the researcher tested data distribution moderation by calculating the Skewness coefficient and the kurtosis of the study sample degrees using the SPSS statistical software package. The results showed a moderate distribution of data. The sample consisted of (92) bigger than (30) so leading the researcher to use parametric statistics to test the research hypotheses.

Hyp.1 There are no statistical differences between the average degree students of the second STEM programs and ordinary programs at the faculty Education-Zagazig University in the self-competence of online technologies and its dimensions. Independent t-test was calculated from table (3).

Table 3

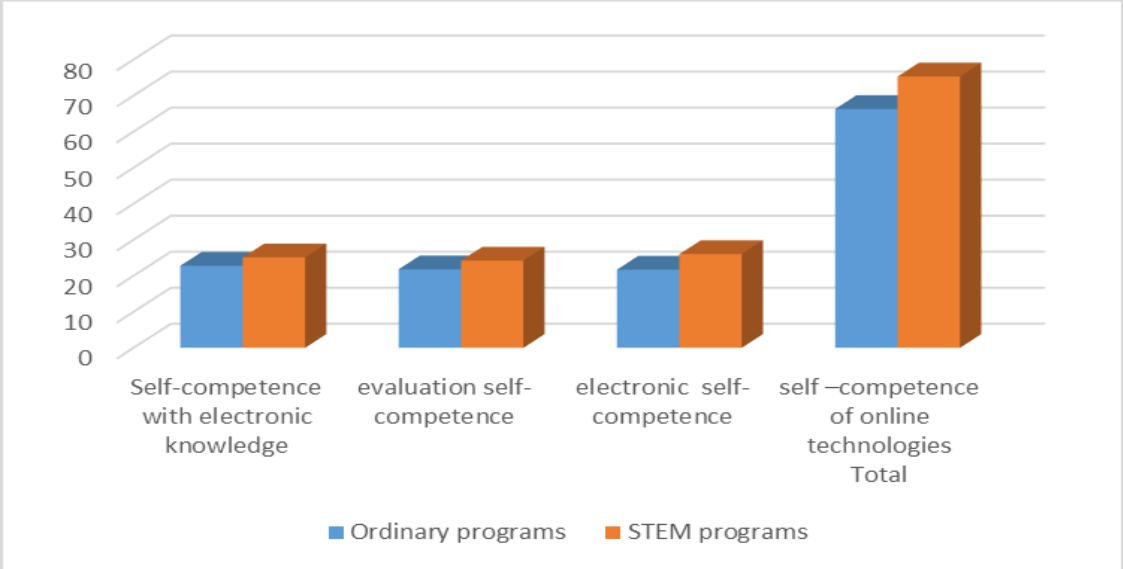
T-test results of differences between both groups in self–competence of online technologies

Variables and Groups		N	Mean	Std. Deviation	T-test and its Sig.
Self-competence with electronic knowledge	Ordinary programs	51	22.8	6.022	2.037**
	STEM programs	41	25.1	4.125	
evaluation self-competence	Ordinary programs	51	21.8	5.764	2.284**
	STEM programs	41	24.2	4.186	
electronic self-competence	Ordinary programs	51	21.7	5.662	4.060**
	STEM programs	41	26.0	4.201	
self –competence online technologies Total	Ordinary programs	51	66.3	15.772	3.078**
	STEM programs	41	75.3	11.319	

**. T-test is significant at the 0.01 level (2-tailed).

Figure 3

The differences between students in (STEM, ordinary) programs in self-competence of online technologies



It is clear from the previous table(3)and figure(3)that there are statistical differences between the average degrees students of STEM programs and ordinary programs at the faculty education in the self-competence to electronic knowledge, evaluation self-competence, electronic self-competence and total degree in favor of the students of STEM programs.

There are statistically significant differences between STEM and ordinary students in self-competence of online technologies, and its dimensions (self-competence to electronic knowledge, evaluative self-competence, and electronic self-competence) in favor of STEM students. This is due to the nature of teaching in STEM is completely different from the nature of teaching in ordinary programs. Since STEM programs a great emphasis is placed on projects, research, and the employment of technology in each activity. Also due to the degree of STEM programs that depend on 80% of the degree on activities and 20% on the theoretical exam.

Hyp.2 There are no statistical differences between the average degree students of STEM programs and ordinary programs at the faculty education- Zagazig University in the academic resilience and its dimensions. Independent t-test was calculated for the following in Table (4):

Table 4

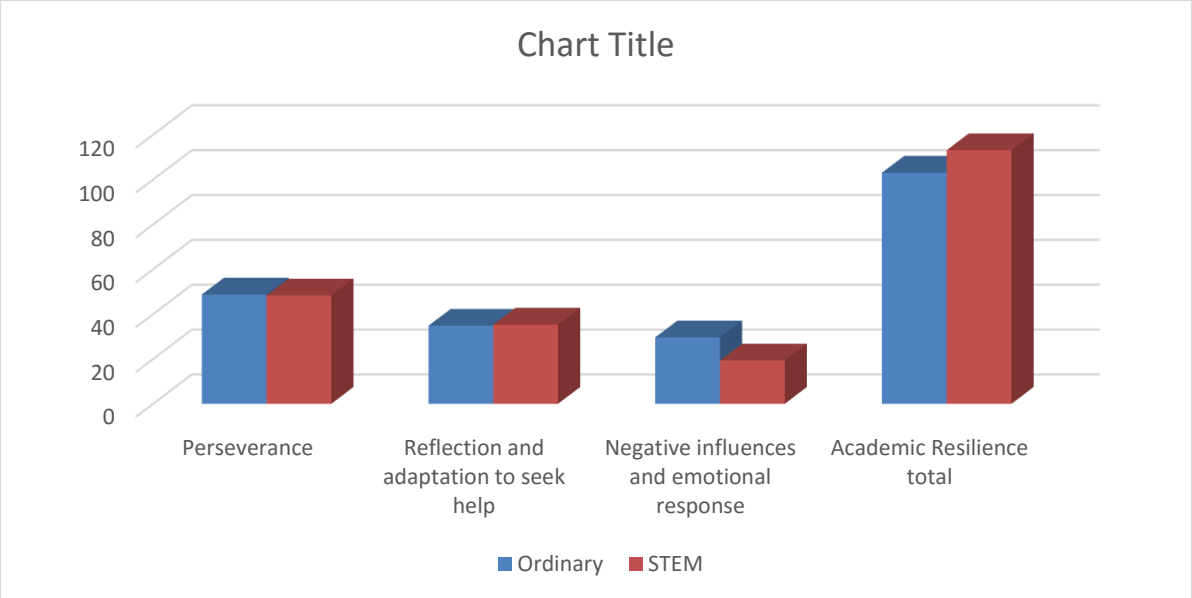
T-test results of differences between both groups in academic resilience

Variables and Group		N	Mean	Std. Deviation	T-value test and its Sig. (2-tailed)
Perseverance	Ordinary	51	48.7	5.56	0.526
	STEM	41	48.3	5.54	
Reflection and adaptation to seek help	Ordinary	51	34.8	5.31	0.263
	STEM	41	35.3	4.13	
Negative influences and emotional response	Ordinary	51	29.6	3.40	2.575**
	STEM	41	19.3	4.25	
Academic Resilience total	Ordinary	51	103.02	8.80	4.860**
	STEM	41	113.08	11.05	

**. T-test is significant at the 0.01 level (2-tailed).

Figure 4

The differences between both groups in Academic Resilience



It is clear from the previous table (4) and figure (4) that there are statistical differences between the average degrees students of STEM programs and ordinary programs at the faculty education in the Academic Resilience total in favor of the students of STEM programs. There are statistical differences between the average degrees' students of the STEM programs and ordinary programs at the faculty education in the Negative influences and emotional response in favor of the students of ordinary programs. There are no statistical differences between the average degrees' students of STEM programs and ordinary programs at the faculty of education in Perseverance and Reflection and adaptation to seek help.

There are statistically significant differences between STEM and ordinary students in Academic Resilience total in favor of STEM students. This is due to the nature of teaching in STEM being completely different from the nature of teaching among ordinary students. Since STEM programs a great emphasis is placed on projects, research, and the employment of technology in each activity. Also due to the degree of STEM programs that depend on 80% of the grade on activities and 20% on the theoretical exam.

While there are statistically significant differences between STEM and ordinary students in Negative influences and emotional responses in favor of ordinary students. This is due to the nature of the courses in STEM programs, since students study and made many activities required of them. But ordinary students are best in Negative influences and emotional responses because they don’t find flexibility in situations and their courses are rigid and lack cooperation work and excitement, In contrast, the courses in STEM programs which based on cooperation work, projects, tasks, life situations. Therefore, students in ordinary programs feel negative emotions towards learning, unlike other students in STEM programs.

The researcher can explain the result that: There are no differences between students in the STEM programs and ordinary programs in perseverance and seeking help because both of two groups have the spirit of perseverance in achieving success & achievement and do effort to request assistance. The best evidence of this is the office hours that the faculty member spends providing assistance to his students, removing difficulties, and removing ambiguities in the course.

But in general students of ordinary programs and STEM programs- according to the nature of the current era and its high scientific, technological and technical progress- have become sufficiently aware of their needs as well as the ways to achieve those needs. The alternatives in front of them are many and available in a way that makes them. They able to compare between the alternatives and choose the best one. They learn about the experiences of others and benefit from its in their lives, accept what they see as right and reject others, persevere in work, ask for help when they need it, and then Academic Resilience.

Hyp.3 There is a relationship between self-competence of online technologies and academic resilience for students in ordinary programs of faculty education at Zagazig University. Pearson Correlation coefficient was calculated for the following in Table (5).

Table 5

Correlations coefficients between self-competence of online technologies and academic resilience for students in ordinary programs

	Academic Resilience total	Perseverance	Reflection and adaptation to seek help	Negative influences and emotional response
Self-competence to electronic knowledge	.453**	.338*	.510**	.123
Evaluation self-efficiency	.493**	.454**	.545**	.011
Electronic self-efficiency	.487**	.384**	.517**	.149
Self-competence of online technologies Total	.528**	.433**	.579**	.104

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

It is clear from the previous table(5) that There is a significant positive relationship at (0.01) between self-competence of online technologies total and its dimensions (Self-competence to electronic knowledge/evaluation self-competence/electronic self-competence) with academic resilience total, Perseverance, and Reflection and adaptation to seek help for students of the ordinary programs in faculty education-Zagazig University. But there is no a significant relationship at level (0.01) between self-competence of online technologies total and its dimensions (Self-competence to electronic knowledge, evaluation self-competence, electronic self-competence) with the Negative influences and emotional response for the students of ordinary programs.

Hyp.4: There are relationship between self-competence in online technologies and academic resilience for students of STEM programs of faculty education at Zagazig University. Pearson Correlation coefficient was calculated for the following in Table (6)

Table 6

Correlations coefficients between self-competence of online technologies and academic resilience for students in STEM programs

	Academic Resilience total	Perseverance	Reflection and adaptation to seek help	Negative influences and emotional response
Self-competence to electronic knowledge	.364*	.452**	.522**	-.344*
evaluation self- competence	.471**	.521**	.546**	-.235
Electronic self- competence	.346*	.483**	.523**	-.423**
self-competence of online technologies Total	.435**	.537**	.586**	-.369*

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

It is clear from the previous table(6) that There is a significant positive relationship at (0.01, 0.05) between self-competence of online technologies and its dimensions(Self-competence to electronic knowledge, evaluation self-competence, Electronic self-competence) with academic resilience total, Perseverance and Reflection and adaptation to seek help for students in STEM programs of faculty education – Zagazig University. But there are no a significant relationship at level (0.01) between evaluation self- competence with the Negative influences and emotional response for the students of STEM programs. Since, there are a significant negative relationship at level (0.01, 0.05) between self- competence online technologies total and its dimensions (Self-competence to electronic knowledge and electronic self-competence) with Negative influences and emotional response for the students of STEM programs.

Discussion and Conclusion

The results of the current study are consistent with the results of Sujiarto et al. (2022), Ahmad and safari (2013), INisa et al. (2023), DelRosario et al. (2023), Abdolrezapour et al.(2023) & Yinka et al. (2022) in there is relationship between self-competence of online technologies and academic resilience (the total degree and the dimensions of perseverance and seeking help).

There are statistically significant differences between STEM and ordinary students in self-competence of online technologies, its dimensions (self-competence to electronic knowledge, evaluative self-competence, electronic self-competence), and Academic Resilience total in favor of STEM students. White and Channing (2023) concluded that both first-generation students (first year in college) and continuing students (higher academic year in college) tend to seek help when they need it. Thorsen et al. (2021) suggest that resilient students rely heavily on both perseverance of effort and interest in school subjects to succeed in their education in any year class.

There are statistical differences between students of STEM programs and ordinary programs at the faculty education in the Negative influences and emotional response in favor of the students of ordinary programs. There are no statistical differences between students of STEM programs and ordinary programs at the faculty education in Perseverance, Reflection, and adaptation to seek help. Because each of them seeks to obtain information and knowledge to raise the value of GPA, the degree of success, and Perseverance in learning. This is due to the nature of the courses, since students study and act their required activities. Ordinary students are best in Negative influences and emotional responses because they are characterized by tension & stress and do not feel the importance of the practical material which they study in the laboratories because they do not receive sufficient appreciation for their efforts. Therefore, students feel negative emotions towards

learning, unlike other students in STEM programs, they have self-confidence that they gain from the interest & care of the country, the media, and all society towards them. the country may be seen STEM programs are the best education systems (based- projects learning) in the future, therefore students in STEM programs feel their importance in life, do not feel negative emotions towards learning and their confidence in themselves increases.

From the theoretical framework, self-competence of online technologies beliefs works to maintain the effectiveness of student performance in education, especially with the shift towards using active learning strategies, multimedia technology, and e-learning. This enhances the characteristics of academic resilience among students at academic risk by providing them with protective factors that contribute to raising their level of academic resilience, such as self-confidence, self-esteem, self-competence, optimism, independence, sense of humor, emotional control, their integration into educational activities, and the warm, open relationship between the student and the teacher. Therefore, there is a positive relationship between self-competence of online technologies and academic resilience (the total degree and the dimensions of perseverance and seeking help). This helps ordinary students and STEM students to succeed and overcome difficulties, but there is a negative relationship between self-competence of online technologies and negative influences among STEM students. Because negative emotions and unpleasant influences adversely affect academic resilience and perseverance in continuing learning and make the student reluctant to seek help Especially with STEM students.

For STEM students, negative and emotional influences negatively affect self-competence with online technologies for all assignments, which are presentations, projects, and research. Assessment takes 80% of the degree, so the relationship between self-competence of online technologies and Negative influences and emotional response was found to be negative. While for

ordinary students, the year's work represents 30% of the subject, so they do not have emotions from failure and rarely present presentations and projects as a form of alternative assessment.

From all the above, the study recommends the following:

- Generalizing the teaching and evaluation methods used with STEM students on ordinary students because they help creativity and get rid of exam anxiety.
- Effectiveness of teaching program to improve self-competence of online technologies and academic resilience.
- Studying the relationship between mindfulness and academic resilience among STEM students.
- The role of academic resilience in creative problem-solving.
- Self-competence, academic resilience and academic achievement for STEM students.
- Predicting academic performance from academic resilience and self-competence

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