



# Using The Rasch Model to Measure Prospective Elementary Teachers' Perception toward Sciencepreneurship, Creative Thinking, Career Adaptability, and Personal Goals

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**Abstract:** The challenge for prospective elementary school teachers in generation Z is teacher professionalism related to learning issues, soft skills, and mastery of technology as demands of the 21st century. Multitasking for prospective teachers often occurs and has an impact on learning. This research analyzes prospective elementary school teachers' perceptions of skills, creative thinking, career adaptability, and personal goals related to learning using Rasch model analysis. The survey method was used in this quantitative research. Research participants were selected using a purposive sample of 70 prospective elementary school teachers. Questionnaires were used in data collection to analyze participant perceptions. The questionnaire was filled out using a 1-4 Likert scale, and the data was then analyzed using the Rasch model. Each instrument element is analyzed in more detail in the Rasch model. The results showed that all participants had an average logit item (+1.03 logit). Person reliability is 0.90, and item reliability is 0.95, meaning each statement item describes the participant's perception. Aspects of sciencepreneurship, creative thinking, career adaptability, and personal goals mutually support the professionalism of an elementary school teacher. The recommendation for further research is to use the Rasch model appropriately to identify participant perceptions.

**Keywords:** Career adaptability; Creative thinking; Personal goal; Sciencepreneurship

## Introduction

Over the years, teachers have been recognized as essential to the academic environment (Derakhshan, 2022; Wang, 2017) In the 21st century, the challenges for prospective teachers, especially Generation Z, who were born between 1997-2012, face the world of work related to soft skills. Problems have arisen due to the Covid pandemic. Many of them have completed their education online, so they have difficulty developing good soft skills, especially in remote places. Teacher competence is the most critical component that shows a student's ability to achieve and perform (Cousins, 2016; Derakhshan, 2022). Teacher competence is related to

emotions, which are very important for human life, so they can significantly influence the academic atmosphere and various areas of learning. When teachers or students experience positive feelings, their success, well-being, and progress become more critical for learning (Baluku et al., 2021; Benson et al., 2007). Meaningful learning is closely related to the equal distribution of teachers. Unmanaged distribution of teachers professionally causes some regions to have an excess of teachers and some to have a shortage. The quality of education in Indonesia is closely related to the quality of teachers and determines the nation's fate in the future (Burić & Frenzel, 2023; Teslo et al., 2023). To overcome this problem, several solutions have been

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proposed, such as strict selection of prospective teachers, developing teacher skills through training, and providing incentives for teachers to work in remote areas. Several studies state that teacher perceptions are essential for improving the quality of learning (Palazón-Herrera & Soria-Vílchez, 2021). By having a good perception of professionalism, teachers can provide higher-quality learning and motivate students to learn better. This will positively impact student learning achievement and teacher performance (Le et al., 2018; Palazón-Herrera & Soria-Vílchez, 2021).

A teacher is expected to have an entrepreneurial spirit, which is always related to creative thinking, career achievement, and life goals. The characteristics of entrepreneurship are always thinking positively, working hard and smart, being disciplined, independent, brave enough to take risks and make decisions, and being creative and innovative (Aslan et al., 2016). Additionally, creativity is a subcategory of emotion, which is important to have for a teacher and society as a whole. According to the literature, creativity is a very important component of education. In this case, creative education requires instructors to create and apply innovative educational techniques, methods, or tasks that suit students' cognitive growth and encourage them to achieve optimal results (Beaird et al., 2018; Daumiller et al., 2021). "Sciencepreneurship" is a term that refers to entrepreneurial practices applied to scientific research and innovation. Although sciencepreneurship is not commonly used in teaching, teachers can incorporate elements of entrepreneurship into learning. Some ways teachers can engage in sciencepreneurship incorporating real-world problems into the curriculum and focusing on problems that exist in the real world, such as environmental problems or health problems (Jumini et al., 2023). Encourage student-led research projects: Teachers can allow students to conduct their research projects individually or in groups. This can help them develop critical thinking, problem-solving, and teamwork skills, vital for entrepreneurship (Kussul, 2015).

Collaborate with industry partners: Teachers can bring real-world expertise into the classroom by collaborating with local companies or organizations. This can help students understand how scientific research is applied in industry and provide opportunities to network and build relationships with potential employers (Palazón-Herrera & Soria-Vílchez, 2021). Emphasizing the importance of communication skills, teachers can help students acquire strong communication skills essential for entrepreneurship. This can include science writing assignments, debates, and presentations (Kim et al., 2019; Le et al., 2018).

Creative thinking (creative thinking) is an essential skill for every student to develop in preparing

themselves to compete as superior human resources in the 21st century. Creative thinking produces ideas that can be applied to world problems (Ali-Fauzi et al., 2018; Suryandari et al., 2021). A student needs creative thinking skills to generate new ideas in developing his career and life goals. Students must know and become science entrepreneurs essential to improving the country's economy (Beaird et al., 2018). Creativity is applying reason, drive, and innovative opinions and ideas to achieve specific goals. According to theoretical definitions, creativity combines talent, progress, and environment in producing unique and purposeful perceptual products (Derakhshan et al., 2022; Plucker et al., 2004). Encouraging students to think creatively and find innovative solutions can help them develop an entrepreneurial mindset. By doing this, they can help students develop the mindset and skills necessary to succeed in a rapidly changing world (Cousins, 2016; SOŁEK-BOROWSKA & CHUDY-LASKOWSKA, 2017).

An individual's ability to adapt and develop in the work environment is a career adaptation (Baluku et al., 2021; Cholifah & Purwandari, 2021). This includes openness to new ideas, learning and acquiring new skills, and flexibility in facing challenges or obstacles. The ability to adapt in a career is important in today's ever-evolving job market, where technological advances require skills and knowledge. Students in learning are essential for developing adaptable careers because individuals acquire relevant new knowledge, skills, and competencies (Benson et al., 2007; Birhan et al., 2021). This involves actively seeking new information, keeping up with industry trends, and continuously improving capabilities. Students with high positive traits can make career choices and adjust career behavior quickly (Othman et al., 2018). By continuing to learn, individuals can improve their adaptability and increase their ability to navigate changes in the workplace, which allows them to remain competitive and relevant in their chosen career path, namely becoming a professional teacher (Lin & Jiang, 2023; Suryandari et al., 2021).

As a teacher, it is important to set personal goals to improve teaching skills that positively impact students continually. Personal goals in everyday life are to help people live happier lives and provide the energy needed to achieve self-transcendence (Benson et al., 2007; Burić & Frenzel, 2023). To motivate and inspire students to learn about sciencepreneurship and professional teachers to help people direct their lives positively (Daumiller et al., 2021) This research can be measured using the Rasch model to analyze the relationship between prospective elementary school teachers' perceptions of skillpreneurship, creative thinking, personal goals, and career adaptability.

Rasch model, in addition, a good assessment instrument should meet several criteria, including good

item validity, good item reliability, different item difficulty levels, and different items that can distinguish participants who are intelligent and can answer the questions from participants who do not understand the question (Shin et al., 2015; Wijayanti et al., 2019). The suitable Rasch model can strengthen the development of new tools, especially in learning. The Rasch model can also test the instrument's validity and reliability with each item's logit value (Bond & Fox, 2007; Bradley et al., 2015; Setiawan et al., 2018). In addition, the Rasch model provides a different approach to using baseline data in educational assessment. For raw data, the results of Rasch modeling measurements aim to obtain a measurement scale with interval similarity. As a result of this measurement, information about student ability and question quality can be accurately determined. Item characteristics and student metrics are generated from item analysis using Rasch modeling (Bradley et al., 2015; Widhiarso & Sumintono, 2016).

Moreover, Rasch modeling has an advantage over other techniques, especially traditional test theory, which can predict missing data because it builds on a systematic pattern of responses (Lee et al., 2021; Setiawan et al., 2018; Widhiarso & Sumintono, 2016). For this reason, this study analyzes the comparison of instrument quality from various aspects, such as accuracy, consistency, and differences in questionnaire instrument difficulty, using the classical test theory approach and the Rasch model. The test item analyzed in this research was a measurement instrument for designing a questionnaire about the role of intelligence, critical thinking, personal goals, and career adaptability. The item analysis was conducted to improve the quality of the evaluation instruments by developing evaluation instruments that measure the participants' abilities in developing students' character at the basic education level. Item analysis is also essential to maintain and improve the quality of research instruments, especially in distinguishing the role of participants in student character development. Several studies have been conducted on teachers' perceptions of continuous professional development and analyzed descriptively (Lin & Jiang, 2023; Shahul et al., 2014; Teslo et al., 2023). Elementary school teachers' perceptions of sciencepreneurship and personal goals associated with teacher professionalism were only analyzed descriptively. The novelty of this research is the integration of sciencepreneurship, critical thinking, personal goals, and adaptive carriers in elementary school teacher education students using Rasch model analysis. Thus, this research uses Rasch modeling to analyze the perception in prospective elementary school teachers of skillspreneurship, critical thinking, personal goals, and career adaptability.

## Method

The Rasch model was used as the research design (Setiawan et al., 2018; Vanzile-Tamsen, 2017; Widhiarso & Sumintono, 2016). Surveys are a data collection method. The definition of the survey method is an approach that depicts current and past conditions (Bond & Fox, 2007; Creswell & Plano Clark, 2011). The survey was conducted over six months, from July to December 2022. The participants included 30 undergraduate students in third-semester elementary school teacher education (participant 1), not yet teachers with 0 years of teaching experience aged 19-20 years, 15 students in fifth semester (participant 2) with ages 19-20 years, and 25 professional teacher education students in position, meaning they have been teaching at school for between 3-5 years (participant 3) with ages 23-25 years. The total number of participants was 70 elementary school teacher education students at Sebelas Maret University in Indonesia, 2021/2022. The participating teachers taught students from lower to upper grades and have worked for over three years. This study used a questionnaire to measure skills, critical thinking, personal goals, and career adaptability. The demographic data of the participants are shown in Table 1.

**Table 1.** The demographic data of the participants

Description	Number of respondents	Percentage of respondents
Gender		
-Female	50	71.42
-Male	15	21.42
-No response	5	7.14
Influence		
Participant 1	30	42.85
- Participant 2	25	35.71
- Participant 3	15	21.42
Age of participant		
19-20 years	30	42.85
20-22 years	26	37.14
23-25 years	14	20.00

### Instrument

The instrument was developed based on instructional analysis and philosophical studies in sciencepreneurship, creative thinking, personal goal, and career adaptability learning. The instrument consisted of 22 statements: 7 statements about sciencepreneurship, 5 statements about creative thinking, 5 statements about personal goals, and 5 statements about career adaptability learning. Respondents chose statements with a score of 1: strongly disagree, 2: disagree, 3: agree, and 4: strongly agree (Creswell & Plano Clark, 2011).

*Collecting of Data*

The data collection method was a response questionnaire on sciencepreneurship, creative thinking, personal goals, and career adaptability learning (Fraenkel et al., 2011). The questionnaire collected quantitative data from undergraduate students in elementary school teacher education at Sebelas Maret University, Surakarta. Data collection was carried out from July to December 2022. The data collection method used a Google form-assisted questionnaire.

*Analyzing of Data*

This quantitative data analysis assessed skills, skillspreneurship, creative thinking, personal goals, and career adaptability learning towards learning using Rasch modeling. Rasch modeling is an analytical tool that can test the validity and reliability of research instruments (Widhiarso & Sumintono, 2016). Rasch modeling also tests the fit of people and items simultaneously. The instrument validity analysis in this study using Rasch modeling was seen from the level of validity of responses to items based on the Outfit Mean Square (MNSQ) accepted value of  $0.5 < MNSQ < 1.5$ . The

suitability of the Z-test with the accepted Outfit Z-Standard (ZSTD) is  $-2.0 < ZSTD < +2.0$ , and the Point Measure Correlation (Pt Mean Corr) is  $0.4 < Pt Mean Corr < 0.85.11$  (Bradley et al., 2015; Widhiarso & Sumintono, 2016). If the service quality instrument items meet at least one of the above criteria, the instrument items are feasible to be used. The validity test conclusion is that all items of the response dimension to strengthening education met the statistical fit criteria, so the instrument could be used for research. Raw data measurement results in data collection in an ordinal scale were then transformed into an interval scale using Rasch modeling with Winsteps software version 3.73 (Widhiarso & Sumintono, 2016).

**Result and Discussion**

Table 2 shows 70 participants with 22 instrument items, with a person reliability score of 0.92 and item reliability of 0.95, meaning that the quality of the instrument items and the consistency of participants' answers are excellent because they are close to a score of 1.

**Table 2.** Summary of person and item measures

	Total score	Measure	INFIT MNSQ	INFIT ZSTD	OUFIT MNSQ	OUTFIT ZSTD
Measure					Partisipan Reliability 0.92	
Mean	78.3	1.29	1.00	-.1	1.09	-.1
SD	10.2	1.24	.54	1.6	1.17	1.8
Max	101.0	4.30	2.91	3.8	9.90	8.5
Min	31.0	-3.86	.24	-3.1	.19	-3.2
Measure					Item Reliability 0.95	
Mean	249.0	0.00	.99	-0.3	1.19	.0
SD	24.7	.99	.41	1.9	1.11	2.7
Max	299.0	2.34	2.42	5.1	6.02	9.9
Min	191.0	-1.99	.61	-2.6	.61	-2.5

Participants: 70 instrument items: 22

Cronbach Alpha (KR-20) test reliability : 0.92

Other data from INFIT MNSQ and OUTFIT MNSQ have values of 1.00 and 1.09, with an ideal value close to 1, showing that the instrument and response answers are consistently good. Table 3 shows that 70 participants measured the difficulty level of the questions, and all participants answered all the questions.

Table 3 states that statement item B22 (participants who aspire to become teachers and entrepreneurs), with the highest logit score (2.34), shows that most participants aspire to become teachers and entrepreneurs. Participants also liked being entrepreneurs rather than teachers with specific criteria (logit 1.34, item B19), indicating that participants were more serious about becoming teachers. The statement of preferring to be a teacher rather than an entrepreneur (B17) with logit (1.22), and the statement of having a

leadership spirit in entrepreneurship with a reasonably confident response. Participants looking for business opportunities other than being a teacher (item B13) had the lowest score (-1.99), meaning that participants needed help finding business opportunities other than being a teacher. Furthermore, the statement of wanting to improve social status by entrepreneurship with a logit score (-1.70), statement (B11) wanting to increase self-esteem by entrepreneurship logit (-1.27), question (B12) choosing a career as an entrepreneur rather than working for someone else logit score (-1.15) with a low logit score below 0.0. This statement shows that the participants only aspire or want to become teachers who are entrepreneurs but are not ready to adopt the character of an entrepreneur who dares to take risks, etc. (Widhiarso & Sumintono, 2016).

**Table 3.** Characteristics of questions from participants

Entry number	Total Score	Measure	MNSQ	Infit ZSTD	MNSQ	Outfit ZSTD	Item
22	191	2.34	1.65	3.0	6.02	9.9	B22
19	217	1.34	1.55	2.3	1.56	2.3	B19
17	220	1.22	2.42	5.1	2.34	4.6	B17
18	232	.70	.89	-.5	.87	-.2	B18
4	230	.65	.70	-1.7	.66	-.6	B5
5	237	.49	.80	-1.1	.84	-1.9	B4
1	241	.32	.92	-.4	.96	-.2	B1
6	242	.28	.66	-2.1	.68	-2.5	B6
7	243	.24	.99	-2.3	.64	-.7	B7
20	244	.19	.61	.0	.96	.0	B20
9	245	.15	.87	-2.6	.61	-1.2	B9
21	246	.11	.95	-.7	.87		B21
2	248	.03	.83	-.2	.98	.0	B2
16	252	-.13	1.00	-1.0	.81	-1.2	B16
14	254	-.21	1.03	.1	1.00	.0	B14
15	254	-.25	.75	.2	1.00	.1	B15
3	255	-1.15	1.10	-1.7	.78	-1.4	B3
8	278	-1.15	1.15	.7	1.09	.6	B8
12	278	-1.15	.72	1.0	1.14	-1.6	B12

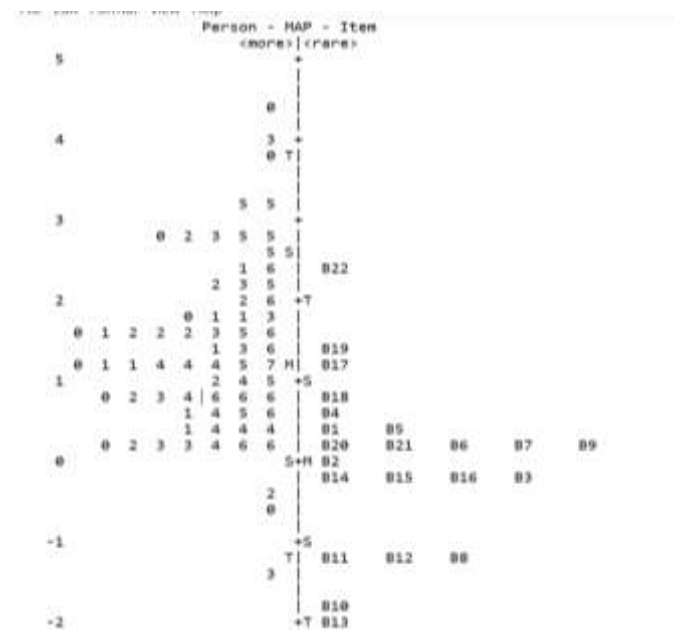
The critical thinking skills of the participants were low, below a score of 0.00 on the logit (-0.25 to -0.13) on the statement of being able to generate creative ideas in dealing with various problems by empowering the resources owned by the campus/school (B3), having strong confidence in starting a business (B15), always looking for information about the business (B14) and having the confidence to manage a business (B16). This statement with a logit below 0.00 indicates that elementary school teacher education students are not ready to become teachers and entrepreneurs. The ideas or concepts conveyed in learning are still normative, and creativity has not yet emerged. For example, the idea is to process fermented nata products into various foods worth selling. Still, the Nata products are only processed into simple syrup drinks with an unattractive appearance. The creativity of ideas in practicum report portfolio products is not yet evident, for example, in preparing problem formulations and detailing tools, materials, and working methods, as well as creativity in discussing research data (Plucker et al., 2004; Suryandai et al., 2022). Creativity begins to emerge in only a few students.

To adapt to a career with statements of having a leadership spirit at work (B18), developing a career as a teacher and entrepreneur (B4), being able to detail business reports well (B5), self-confidence in future career success (B20) with a logit score above 0 .00, this shows that participants have the motivation to develop a career as a teacher with a sciencepreneurship character (Kussul, 2015).

Aspects of life goals with statements of confidence in starting a business (B8), self-confidence in business (B9), having a leadership spirit in business (B11), and

confidence in being successful in entrepreneurship (B7) with a logit score above 0.00 indicates that participants are confident about his life goal to become a teacher.

This research indicates that creative thinking, personal goals, and career adaptability are proximal factors of entrepreneurial intentions implemented in learning. This aspect is an important explanation for why highly creative thinking individuals have stronger and more attractive entrepreneurial intentions in supporting a career as a teacher. These findings align with previous research showing that career adaptability mediates the relationship between personal goals, career maintenance, and entrepreneurial intentions.



**Figure 1.** Map variables

Figure 1 shows that the distribution of participants on the left is above the score (0.0), and the right side is the instrument items with the statement "I will look for business opportunities other than being a teacher (B13), which at the bottom shows the statement most agreed with by the participants. Adaptation in career, life goals, teaching, and learning are interconnected concepts that can influence each other. A teacher's life goals can influence their career choices and teaching style. For example, a teacher who values social competence might prioritize developing her social competence and teaching it to her students. Learning and life goals and a positive learning environment can help students achieve academic goals and develop life skills (Lin & Jiang, 2023). Positive interpersonal relationships and interactions characterize a positive environment. Teachers must adapt their teaching styles to meet the needs of their students (Zhi & Wang, 2023). Personal adaptability is becoming increasingly important because society and technology are developing rapidly. Learning how to adapt to a changing world helps people adapt to changes when coping with their career roles and maintain the ability to balance their career roles, which will affect their crucial psychological resources for career development and achievement (Chen et al., 2020). This may involve using different techniques, strategies, and teaching methods to suit student learning styles. Effective learning requires adaptation to learner needs. Teachers must be able to adapt their teaching style to suit their students' learning styles (Othman et al., 2018; Szymkowiak et al., 2021). In summary, a teacher's life goals, teaching style, and career development can all influence each other, as can the learning environment and the need for adaptation in the teaching and learning process.

Sciencepreneurship and career adaptation are interrelated; someone with an entrepreneurial spirit must adapt to changes in their business according to technological developments (Maison et al., 2020). They must develop new skills and adapt to existing changes (Le et al., 2018; Lin & Jiang, 2023). Thus, it can be concluded that sciencepreneurship, career adaptation, life goals, and learning are closely related because they influence each other. Teachers with the nature of sciencepreneurship must always learn to develop knowledge and technology, especially in learning, guided by the Technological Pedagogical Content Knowledge (TPCK) framework (Kim et al., 2019). The research recommends that it is very interesting to research and compare prospective elementary school teachers whose parents have an entrepreneurial background to prospective teachers who do not have an entrepreneurial background regarding creativity in

thinking, personal goals, and career adaptability with teacher professionalism.

## Conclusion

This research concludes that the Rasch model is very effective for measuring sciencepreneurship, creative thinking, personal goals, and career adaptability for prospective elementary school teachers. This research implies that every education study program can integrate these aspects into the curriculum. Sciencepreneurship, creative thinking, career adaptability, and personal goals are all important for teachers to consider in professional development in teaching. Sciencepreneurship refers to the ability to apply scientific knowledge and skills to create innovative solutions and products that can be commercialized. Creative thinking is critical for teachers to develop new and effective teaching methods and approaches to engage and inspire their students. Career adaptation is crucial for teachers to remain relevant and competitive in the job market, especially in the face of technological advances and changes in educational policies. Personal goals are essential for teachers to have a clear direction and purpose in their career and life, which can help them stay motivated and reach their full potential. By cultivating knowledge, creative thinking, career adaptability, and personal goals, teachers can improve their professional skills and contribute to the development of the education sector.

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## Author Contributions

Conceptualization: Suryandari, Derakhshan; methodology, Creswell & Plano; validation, investigation, Widhiarso & Sumintono, All authors have read and agreed to the published version of the manuscript.

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## Conflicts of Interest

The authors declare no conflict of interest

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