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Global cross-sectional survey on higher education institutions: Analysing the assessment of instrument for evaluating academic expertise on teaching, research and community service

Survei lintas sektor global pada institusi pendidikan tinggi: Analisis penilaian instrumen untuk mengevaluasi keahlian akademik dalam pengajaran, penelitian dan pengabdian masyarakat

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Abstract

Globally, the discussion on expertise assessment in higher education institutions has long been a topic in academic literature. However, there is currently no specific measure of academic expertise based on the roles of academics in carrying out their core functions, such as teaching, research, and community service. A recent literature review proposed twenty-nine academic expertise criteria in assessing the three academic tasks. The present study conducted a validity test of these proposed criteria by employing exploratory factor analysis and principal axis factoring. The study sample comprised three hundred and thirty-one respondents, who were gathered through a worldwide survey. The results indicate that the division of the three academic functions is shown in the final model of the measure. This model consists of three factors, each encompassing various indicators of teaching, research, and community service. The study contributes to the validitation of the academic expertise criteria, which can be further used in developing the expertise scale adjusted to higher education institutions.

Keywords: academic expertise; exploratory factor analysis; teaching, research and community

Abstrak

Secara global, pembahasan tentang asesmen keahlian di lembaga pendidikan tinggi telah lama dikemukakan dalam literatur. Akan tetapi, belum ada ukuran khusus keahlian akademik yang didasarkan pada peran akademisi dalam menjalankan fungsinya, seperti pengajaran, penelitian, dan pengabdian kepada masyarakat. Sebuah tinjauan literatur terkini mengusulkan dua puluh sembilan kriteria keahlian akademik dalam menilai tiga tugas akademik tersebut. Penelitian ini menjalani uji validitas yang melibatkan kriteria yang diusulkan tersebut dengan memanfaatkan analisis faktor eksploratori dan pemfaktoran sumbu utama. Penelitian ini melibatkan tiga ratus tiga puluh satu responden yang dikumpulkan melalui survei di seluruh dunia. Hasilnya menunjukkan bahwa pembagian ketiga fungsi akademik ditunjukkan dalam model akhir pengukuran. Model ini terdiri dari tiga faktor yang mencakup berbagai indikator pengajaran, penelitian, dan pengabdian kepada masyarakat. Penelitian ini telah menjelaskan validitas kriteria keahlian akademik, yang selanjutnya dapat digunakan dalam mengembangkan skala keahlian yang disesuaikan dengan lembaga pendidikan tinggi.

Kata kunci*: keahlian akademis; analisis faktor eksploratif; pengajaran, penelitian dan pengabdian*

Introduction

Teaching, research, and community service are the three prominent roles or activities expected of academics in many higher education institutions (Menon & Suresh 2020, Jones et al. 2021, Chankseliani et al. 2021). The emphasis placed on each activity can vary between institutions and even departments. The level of acquired skills in these activities is crucial in determining the success of academics or faculty members in performing their tasks. Enhanced skills will also lead to better outcomes in higher education institutions (Balzer 2020).

The Dreyfus and Dreyfus model suggests that the acquisition of a new skill typically progresses through five stages: novice, advanced beginner, competent, proficient, expert and master (Mangiante & Peno 2021). The level of acquisition skill can be distinguished from novice to expert levels. As argued by Swanson (2007) today's and future challenges clearly require professionals to be experts who can adapt to change while performing exceptionally well to improve their situations. We argue that this requirement also undoubtedly applies to academics in higher educational institutions.

For instance, Mølstad & Pettersson (2019) found that several studies on expertise development have been conducted, with one of the recent being the assessment of expertise (Quast 2020). He further added that, expertise is often ascribed to persons, who are considered exceptionally competent in a particular subject. However, the analysis of academic expertise remains incomplete despite the existence of several instruments to assess the competence of academics (Suhaemi & Aedi 2015, Rodríguez-Gómez et al. 2016, Pekkarinen & Hirsto 2017). This situation is understandable due to the diversity of academic roles and activities, which may create difficulties in accurately measuring specific performances or maintaining consistency across roles. Blackmore & Hatley (2022) suggest that functional analysis could provide an opportunity to observe the diverse tasks performed by academics and better understand the complexity of academic expertise. The current study, therefore, aims to fill this gap by identifying underlying patterns among the three academic roles i.e., teaching, research and community which can be easily interpreted and understood to assess academic expertise. To achieve this, we utilize a factor analysis method on the measure we previously constructed, informed by systematic literature analysis.

The structure of this manuscript is organized into sections covering the introduction, theory, methods, results and conclusions. The study also provides a theoretical framework based on the Skill Acquisition Theory and scientific literature on academic activities. We explain the methods undertaken to pursue the aim of the study. Subsequently, we also presented the results obtained from our research. Additionally, we enhance the work and engaged in a discussion to interpret these findings and provide original context. At the end, the conclusion summarizes our study's key points and offer insights based on the discovered patterns.

The Skill Acquisition Theory, as introduced by Dreyfus & Dreyfus (1986), has significantly influenced our understanding of how individuals progress through five distinct stages: novice, advanced beginner, competent, proficient, and expert. According to this theory, individuals evolve from relying on explicit rules to gradually embracing intuitive and holistic decision-making as their expertise matures. The in-depth description of the Dreyfus and Dreyfus model allows for a thorough exploration of the cognitive and experiential facets that define each stage.

Originally developed to explain skill acquisition in computer programming, the theory has been extended to other fields. Its adaptability underscores its value as a conceptual scaffold for understanding expertise development across professions. Specifically, the model acknowledges that experts often rely on tacit knowledge and intuitive judgments—an understanding that aligns with the complex, context-dependent nature of real-world decision-making. This model represents a deeper level of understanding and capability, transitioning from rigid rule-following to intuitive and innovative expertise.

However, the theory gives limited attention to the transferability of skills across domains. Expertise in one area does not necessarily guarantee proficiency in another, and the model does not fully address the factors that can affect the transference of skills in desirable fields. Moreover, while acknowledging the role of tacit knowledge is a strength, the theory might overstate its role in expertise. Critics argue that explicit, codifiable knowledge also plays a crucial role, especially in domains where procedural rules and guidelines are paramount (Ericsson et al. 1993). Furthermore, Dreyfus and Dreyfus primarily focused on individual cognitive processes, while in many professions, expertise is cultivated within a community of practice influenced by social and cultural factors (Dreyfus & Dreyfus 1986).

Germain & Tejeda (2012) conducted a preliminary exploration highlighting the pressing need for psychometric scales to capture the nuances of expertise across diverse domains. Drawing from inspiration from their insights, our theoretical framework places a particular emphasis on the dynamic and evolving nature of academic expertise within the higher education landscape by recognising the triad of academic roles—teaching, research and community service. These three dimensions, intricately interwoven, constitute the core activities expected from faculty members in higher education institutions.

The theoretical foundation aligns with Germain and Tejeda's call for comprehensive scales that consider the multifaceted nature of expertise development. The multi-dimensional nature of teaching, research, and community service presents unique challenges in measuring expertise.

While existing instruments fall short of accommodating this diversity, the study's theoretical framework strives to address this gap by seeking underlying patterns that can be universally interpreted and understood. This framework also extends beyond a mere functional examination of academic roles. Additionally, Germain and Tejeda's emphasis on the dynamic nature of expertise aligns with our goal to move beyond functional analysis. Hence, the aim is to uncover the complexities of academic expertise and provide a more nuanced understanding that transcends the limitations of traditional analytical approaches in higher education institutions.

Research Method

The study adopted a quantitative research approach, designing a survey to collect data from different countries. To achieve the aim of the study, this research primarily utilized factor analysis to validate the associations between different constructs, specifically to assess academics' expertise based on their three prominent roles in higher education institutions. Factor analysis employs mathematical procedures to simplify interrelated measures and discover patterns in a set of variables (Shrestha 2021). Additionally, a parsimony model selection was applied as a tool for assessing fit propensity (Falk & Muthukrishna 2023). In this study, we specifically focused on exploratory factor analysis to map out the factor-item configuration due to the unavailability of an academic model of the measure. The constructs were developed based on a systematic literature review and were confirmed through an expert panel discussion of previous studies. These constructs can be used as an instrument for assessing academic expertise. We also employed factor analysis to check the validity of the instrument by identifying the underlying patterns of items and factors (latent variables).

The study invited and gathered academicians from around the world to test the proposed measure. We created an online survey using the Qualtrics platform and distributed it to a list of academicians that we had compiled prior to the survey. The sampling criteria for the survey required participants to be academicians in higher education with a doctoral degree. We did not include minimum years of employment or teaching and research experience because this would have introduced additional challenges in investigating the issue. For example, there are cases where doctoral candidates were obliged to carry out limited supervision and teaching duties during their studies. In the meantime, there were also many cases where academicians have teaching and research experience prior to their doctoral studies. This variability implies that years of employment may not be the best criterion for determining their expertise, nor are years of teaching and research experience, since they can be difficult to quantify. Therefore, only respondents with a doctoral degree were considered.

In total, 529 respondents participated in the survey. The participants came from a diverse set of countries, such as US, UK, France, Netherland, China, Indonesia, Malaysia, Estonia, Russia, and engaged with MIT, Harvard, John Hopkin, Surrey, Nottingham, Universitas Indonesia, Universitas Airlangga and Pretoria Universities. However, after excluding respondents with a substantial number of missing data, we included only 331 respondents in the final analysis. These respondents were associated with higher education institutions as lecturers and had at least a doctoral degree. For visualization purposes, we categorized the universities by their country of origin and fields of discipline into two broad categories: natural science (including engineering) and social sciences and humanities.

As mentioned earlier, several measures of academic expertise exist in the literature. However, these measures are argued to still lack the ability to evaluate the various academic roles and activities, which are generally summarized into three main roles: (1) teaching, (2) research, and (3) community service. Building upon Germain and Tejeda's work, we embarked on the construction of a novel measurement tool designed to capture these intricate facets of academic expertise. Our approach integrates a systematic literature review and expert panel judgment to establish the constructs that form the basis of the instrument. The resulting scale encompasses 29 indicators (see Table 1), each strategically chosen to reflect the nuanced characteristics indicative of academic expertise (Kurniawan et al. 2023).

Table 1.
List of expert indicators

Statements	
1. At least five years of experience in teaching at higher education institutions by designing and delivering high-quality material.	16. Significantly contribute to the study evaluated by their peers.
2. Teaching skill is recognized by their supervisor, peers, students, and experts in the same field.	17. Show the high quality of study evaluated by their peers.
3. Skilfully to handle teaching-related tasks.	18. Communicate their project study effectively to the members of expert committees.
4. Show good communication skills in delivering the teaching materials.	19. Update and validate the information regarding the expertise of others in their field of study.
5. Utilization of appropriate media tools to express effective ideas while teaching.	20. Expand their practical knowledge and apply it.
6. Regularly develop teaching-related expertise and knowledge to remain advanced.	21. Aware of state-of-the-art research topics in their field.
7. Should have current knowledge about field.	22. Academic collaborations both internationally and nationally.
8. Able to solve the problem analytically and reflectively.	23. Conducted a study productively related to their field.
9. Delivering of topic to the students with great interests.	24. The participants have a Doctorate related to their field of study.
10. Support and help students to become familiar with the topic.	25. Relevant training in study methods.
11. Grab the attention of students while delivering the materials.	26. Contribute significantly to the community related to their expertise.
12. The participant has a Doctorate.	27. Conduct human-capital capacity-building activities in the community.
13. Relevant training to improve their expertise.	28. Influence and convince the community of a better life.
14. Relevant training in teaching in higher education.	29. In addition, the participants identify the social problem in the community and give solutions.
15. Confidence in delivering the teaching materials to enable the students to pay attention to them.	

Source: Author's contributions

Following the review, we used exploratory factor analysis (EFA) to test the validity of the 29-item measure (see Table 1). By using principal axis factoring (PAF), we aimed to test whether the 29 indicators would form the three factors of academic roles that reflect academic expertise. In the following paragraphs, we detail the preparation and focus of the analysis.

Watkins (2018) asserted that EFA is a crucial statistical tool in developing and testing a measure's validity. In this study, thus, EFA was employed for two main purposes: first, to identify factors or latent constructs that represent academic expertise, and second, to draw items (measured variables) and factor configurations that precisely measure academic expertise without including low-relevance items.

The review that has been conducted previously contributes to the items as possible to ensure possible representation and to valid and reliable measures. By aiming to achieve these two goals, we primarily tested whether the items correspond to their designated factors and, most importantly, whether the item-factor configuration met the statistical requirements recommended for EFA (Costello & Osborne 2005, Kyriazos 2018, for further explanation on EFA recommended practice).

To evaluate the basic assumptions, we conducted a normality test for each item prior to running EFA (Watkins 2018). Since factors exert a linear function on the items, having a normal and linear distribution of the data is essential in EFA. The results showed that all items have skewness and kurtosis values below the suggested cut-off values for normality (< 2 and < 7, respectively). Further, we ensured that we had an adequate number of respondents by adhering to the study by Costello & Osborne (2005) that proposes a subject-to-item ratio of 10:1. Hence, the study sample of 331 respondents to run the analysis.

We employed five parameters in conducting EFA. First, we used a common factor model for the estimation, specifically principal axis factoring (PAF) using SPSS v.27 (Schmitt 2011). The PAF estimation method enables us to check the item-factor configuration while maintaining a high level of variance explained by the identified factors (Setiawan et al. 2023). Second, we applied the Kaiser Meyer Oklin Measure (KMO) and Bartlett's sphericity test to check whether the sampling was adequate enough to proceed to EFA and whether there was a relationship between variables in multivariate cases (Hadia et al. 2016). We accepted a KMO value of at least between 0.70-0.80 and the sphericity test at the level of ≤ .05 significance value. Third, since we assumed that the three factors of academic expertise are correlated, we used oblique rotation in the form of Promax rotation in SPSS. To do fairness to the data, however, we first ran both orthogonal and oblique rotations to check which initial results would explain the more considerable variance. Additionally, the minimum eigenvalue of a matrix value should be one to ensure the stability of the factor produced (Hadia et al. 2016, Watkins 2018). Furthermore, to show strong correlations between items and their corresponding factors, the factor loading of each item should be at least 0.30 (Watkins 2018), hence we set the threshold to a minimum of 0.40.

Results and Discussion

This section explains the factor configuration and item-factor configuration. In this part, we also provide the "goodness of fit" of the selected model through the KMO and Bartlett's sphericity test and the Eigenvalue (and variance explained) of each formulated factor.

Factor and item-factor configurations

Given our expectation of three factors, i.e., teaching, research and community service, we conducted EFA using the PAF estimation method with orthogonal rotation. Previous studies have been divided into the relations between factors (Suhaemi & Aedi 2015, Rodríguez-Gómez et al. 2016, Blackmore 2000). Some studies have argued that the three factors are interdependent upon each other (Jackson & Marley 2007, Ghannam 2007, Schütte & Köper 2013, Raagmaa & Keerberg 2017). In comparison, others are not clear whether the factors are interrelated (Ericsson et al. 1993). Therefore, in running the first EFA model, we combined all 29 items and used Varimax rotation, set the threshold of Eigenvalue to 1, and suppressed items with factor loadings below to 0.4. At this stage, we aimed to identify whether any additional interesting factors might emerge without predetermining number of factors.

The first model showed a KMO of 0.93, indicating an excellent level of sampling adequacy. Bartlett's sphericity test does not show that the results yield an identity correlation matrix, demonstrated by a significance level of 0.00. All these allowed us for further analysis. Moving to the Eigenvalue and percentage of variance explained by each factor, we observed six factors: the first factor had an Eigenvalue of 10.29, the second factor having 2.23 Eigenvalue and the rest of the factors ranging from 1.77 to 1.02. Together, these factors explained 61.3% of the variance in the data. In a psychological study, this is considered a good variation (Linting & Van Der Kooij 2012). In the rotated pattern matrix, we observed multiple items loaded on several factors, i.e., items stating, "He/she can solve problems analytically and reflectively" and "He/she uses appropriate media to express their ideas effectively in teaching sessions". This shows that these items are less clear on which factors they refer to.

Table 2.
A 4-factor model (PAF, Promax rotation)

Item	h^2	F1	F2	F3	F4
Aware of state-of-the-art research	0.50	0.81			
Conducts research productively	0.56	0.74			
Significantly contributes to the field of research.	0.47	0.67			
Update and validate the information regarding the expertise in research.	0.56	0.67			
Peers can communicate research projects effectively to the members of expert committees.	0.52	0.63			
Evaluated by peers, and they shows high quality of research.	0.48	0.56			
Relevant training in research methods.	0.37	0.56			
Expands practical knowledge in research.	0.42	0.47			
Relevant research collaboration activities both internationally and nationally.	0.40	0.47			
Deliver the knowledge to the students by interests.	0.69		0.94		
Helps students become familiar with the topic.	0.66		0.81		
Grab the attention of students while delivering the materials.	0.56		0.68		
Shows confidence in delivering the teaching materials so that the students pay attention to them.	0.45		0.42		
Advance knowledge about field.	0.39		0.40		
Conducts human-capital capacity-building activities in the community.	0.63			0.82	
Influence and convince community for better life.	0.60			0.78	
Identify the social problem in the community and give solutions.	0.62			0.76	
Contributes significantly to the community related to expertise.	0.54			0.60	
Minimum 5 years of experience in teaching at higher education institutions, i.e., designing and delivering high quality material	0.64				0.83
Recognized teaching skill by supervisor, peers, students, and experts in the same field	0.50				0.62
Have a doctoral degree	0.19				0.45
Eigenvalue (variance explained)		7.97 (34.3%)	1.85 (8.8%)	1.49 (4.6%)	1.16 (3.4%)
Cronbach's Alpha		0.87	0.83	0.85	0.65

Note: F1=research expertise; F2=teaching ability; F3=community service; F4=teaching recognition

Source: Author's contributions

Consequently, we removed these items and ran a second model using the same estimation method. The resulting model maintained a similar KMO and Bartlett's sphericity test, 0.92 and significance at 0.00, respectively. The number of factors was reduced to four, in which the percentage of variance explained is at 49%. When moving to the rotated pattern matrix, we observed several items loaded on double and even triple factors. For instance, items like "He/she has relevant training to improve his/her expertise in his/her field" and "He/she has relevant training in teaching at higher education." This prompted us to try the same model with oblique rotation to see if it would reveal any substantial variations. The KMO and Bartlett's sphericity test shows no difference, and we also obtained the same number of factors. From here on, we tested the next model using Promax rotation, with the assumption that the factors are interrelated.

For the third model, we removed double-loaded items, such as the ones mentioned previously. The sampling adequacy is still shown high, with a KMO of 0.92. Likewise, Bartlett's sphericity test is also shown significant at the level of 0.00. The number of factors remained at four, and maintains a good portion of variance explained, with 50.6%. We observed no double-loaded items, and all items are at minimum of 0.40 in their factor loading. All the items are loaded carefully in their corresponding factor, with teaching dimension is divided into two factors: one involving teaching students directly and the other involving teaching experience and recognition. Although the measurement model seems to be different from our assumption, which is a three-factor model, the analysis shows us that teaching ability and teaching recognition should be differentiated and cannot be considered in the same dimension. The Table 2 displays the complete configuration of the final solution to our academic expertise scale. Regarding reliability, each factor showed high consistency, as demonstrated by Cronbach's alpha value ranging from 0.65 to 0.87.

Additionally, we ran correlational tests across disciplines to examine the associations between emerging factors. We included 312 sample of the respondents for this test since 19 participants did not mention their discipline/subject. This study broadly categorized the disciplines into "Natural science and engineering" and "Social Sciences."

Table 3.
The correlation between factors across disciplines

Natural science and engineering (bottom part of the matrix)				
Social Sciences (top side of the matrix)	**F1**	**F2**	**F3**	**F4**
F1	1	0.61	0.59	0.26
F2	0.66	1	0.35	0.28
F3	0.65	0.47	1	0.24
F4	0.49	0.33	0.46	1

Note: bold indicates significance at the level of p<.05.

Source: Author's contributions

According to the correlation matrix in Table 3, we found significant positive correlations between the four factors for each discipline. The strongest correlation was between F1 and F2, followed by F1 and F3, for both natural science and engineering and social science disciplines. This result indicates a strong interplay between research and teaching expertise were intertwined to form academic expertise, and that research quality is in line with community service. The weakest correlation were found between F2 and F4 in natural science and engineering discipline and between F3 and F4 in social sciences discipline. Finally, we conducted descriptive analysis for each valid item to provide an overview of the differences that may occur across disciplines (see Table 4).

From the t-test analysis (Table 4), we find that there is not much of a difference between disciplines in how respondents perceive the relevance of expertise items. The difference we observe is merely on two items. One, whether a scholar needs to have relevant training in research method, as respondents in social science (M=4.12, SD=0.79) perceive it to be more pertinent compared to those in natural science and engineering (M=3.86, SD=0.78): t(310) = -2.90, p = 0.004. Two, whether a scholar needs to expand their practical knowledge and apply it in their research, as respondents in social science (M=4.22, SD=0.65) perceive it to be more important compared to those in natural science and engineering (M=4.10, SD=0.67): t(310) = -2.00, p = 0.046.

Table 4.
Descriptive analysis for each valid item

Variables	Social sciences (*N*=158)		Natural science and engineering (*N*=154)		
	M	***SD***	***M***	***SD***	***T-test***
Aware of state-of-the-art research	4.25	0.68	4.29	0.62	0.52
Conducts research productively	4.16	0.75	4.16	0.71	-0.03
Significantly contributes to the field of research.	4.12	0.65	4.05	0.73	-0.95
Update and validate the information regarding the expertise in research.	4.08	0.76	4.03	0.71	-0.67
Peers can communicate research projects effectively to the members of expert committees.	4.02	0.81	4.08	0.73	0.68
Evaluated by peers, and they shows high quality of research.	4.16	0.70	4.06	0.76	-1.21
Relevant training in research methods.	4.12	0.79	3.86	0.78	-2.90
Expands practical knowledge in research.	4.22	0.65	4.10	0.67	-2.00
Relevant research collaboration activities both internationally and nationally.	3.87	0.93	3.86	0.85	-0.10
Deliver the knowledge to the students by interests.	4.37	0.71	4.31	0.69	-0.78
Helps students become familiar with the topic.	4.29	0.71	4.31	0.67	0.18
Grab the attention of students while delivering the materials.	4.22	0.75	4.06	0.76	-1.90
Shows confidence in delivering the teaching materials so that the students pay attention to them.	4.28	0.70	4.25	0.73	-0.31
Advance knowledge about field.	4.47	0.64	4.40	0.67	-0.97
Conducts human-capital capacity-building activities in the community.	3.86	0.80	.754	0.75	-1.96
Influence and convince community for better life.	3.87	0.83	3.80	0.82	-0.73
Identify the social problem in the community and give solutions.	4.02	0.79	4.00	0.78	-0.21
Contributes significantly to the community related to expertise.	4.03	0.85	3.95	0.77	-0.84
Minimum 5 years of experience in teaching at higher education institutions, i.e. designing and delivering high quality material	3.84	0.91	3.86	0.80	0.23
Recognized in teaching skill by supervisor, peers, students, and experts in the same field	3.94	0.86	3.97	0.79	0.33
Have a doctoral degree	3.96	0.91	4.11	0.84	1.49

Note: Value shows significance at the level of p<.05.

Source: Author’s contributions

The application of EFA has provided valuable insights into the underlying structure of the academic expertise scale—the final model revealed a four-factor model summarising the research, teaching expertise, community service, and experience. Although we could not run measurement invariance due to a relatively small number of respondents when categorized by disciplines, based on the score differences across disciplines, specifically natural and social science, we can claim that respondents from both disciplines do not essentially differ in perceiving the relevance of all the items. While resonant with the theoretical underpinnings of skill acquisition, this empirical representation adds granularity by contextualizing expertise within academia.

Specifically, the first factor, which is the research dimension, contains nine items and is the only factor with item differences between disciplines. The factor explains as much as 34% of the variance in the data and, by this, suggests that this factor could be the cornerstone of academic expertise. The research expertise includes contributions to studies evaluated by peers, awareness of state-of-the-art research, and effective communication of the projects. It is found that, within this factor, lecturers from the social science discipline regard relevant training in research methods as more critical than those in natural science and engineering. This result is not entirely logical, considering that two prominent research paradigms exist in social science: qualitative and quantitative (Creswell 2014). Therefore, having relevant training in each of these methods enable social science researchers to develop a certain level of expertise in employing either of the methods (or even a mixed approach). On the other hand, natural science and engineering primarily focus on the quantitative research method.

As for the second factor, the teaching ability dimension contains five items and explains 8.80% of the variance in the data. Teaching ability is one of the newly emerging factors based on our analysis. In the previous literature, academic expertise is often descrbed as comprising three interrelated factors, which are teaching, research, and community service. However, based on our factor analysis, we observed that teaching should be divided into two different dimensions: teaching ability and teaching experience. Teaching ability involves items such as "He/she can deliver the topic to the students interestingly" and "He/she helps students become familiar with the topic." This dimension is also found to be strongly correlated with the research dimension in both disciplines, either social or natural sciences. This suggests that the research skills let them to confidently teach students in an interesting manner and, vice versa, that teaching ability also foster them strengthens to conduct state-of-the-art research investigation.

The third factor, the community service dimension, contains four items that focus on the relevance of lecturers' ability to apply their expertise to improving the community. Like the teaching factor, we observed no significant mean differences in all the corresponding items between the two disciplines. Interestingly, we noted a high correlation between research expertise and community service dimensions across disciplines. This is practical, as one of the goal of higher education is to put expertise into practice for the better welfare of the community and development.

Finally, the fourth factor is the second new emerging factor from our analysis, which is teaching recognition. This dimension involves three items, asking the relevance of experience in teaching in higher education, recognition for their teaching skills, and the requirement of a doctoral degree. The main difference between this dimension and the teaching ability dimension lies in the relevance of ability and recognition, with the latter often found in administrative documentation. Through this finding, we acknowledged that academic expertise in higher education is not simply about skills or ability but also involves certain qualifications that allow academic staff to develop professionally during their study endeavours. Following this, it is sensible that having a doctoral degree is considered an important criterion of academic expertise. In many countries, doctoral candidates are often assigned teaching tasks, which allows them to build their teaching portfolio. Therefore, this criterion indicates not only teaching experience but sometimes recognition as well.

Another interesting finding from the final scale is that the highest factor loading pivots on the ability of lecturers to deliver their teaching to students engagingly. This item or variable is followed by the items or related to their ability to help students become familiar with the topic, which is highly related to their previous ability. As noted previously, there is a high correlation between research expertise and teaching ability in both disciplines. This finding is logical because a researcher needs a good understanding of fundamental knowledge in their field to conduct research on relevant topics and disseminate the results.

These results also align with Dreyfus and Dreyfus's acknowledgement of tacit knowledge and intuitive judgments in expert decision-making (Dreyfus & Dreyfus 1986). However, the current study's findings also highlight the multifaceted nature of academic roles, demanding a more comprehensive understanding beyond individual cognitive processes. The contrast between theoretical assertions and empirical realities becomes pronounced when examining skill transferability across domains. While skill acquisition theory posits a linear progression, our analysis reveals nuanced interconnections between teaching, research, and community service, challenging the notion of expertise due to cross-functional collaborations. Furthermore, the discourse on explicit, codifiable knowledge in expertise development gains prominence in light of these findings. While Dreyfus & Dreyfus (1986) emphasized tacit knowledge, the empirical evidence suggests a symbiotic relationship between explicit knowledge acquisition and the manifestation of practical expertise.

Our findings also align with Swanson (1994), who underscored the need for academic experts capable of adapting to change and excelling in various roles while emphasising the integration of teaching, research, and community service. The flexibility demonstrated in EFA by discipline also reinforces the adaptability of our instrument across diverse academic contexts. Moreover, by embracing a factor-based model and acknowledging the interconnectedness of expertise with the broader academic community, this study aligns with the social constructivist perspectives on knowledge construction coined by Brown & Duguid (2017).

The fact that despite the disciplinary differences, the factors of expertise remained consistent supports the model's robustness. The factors 'Community Service Expertise' and 'Problem Solver' continued to play a vital role in both disciplines, demonstrating the generalizability of the proposed model across diverse academic fields. The identified factors can also serve as a foundation for developing comprehensive models for academic expertise assessment that are more intricate and aligned with the critical examination of functional analysis by Blackmore & Hatley (2022).

Germain & Tejeda's (2012) emphasis on comprehensive scales underscores the importance of taking expertise development's multifaceted in nature. By integrating theoretical frameworks with empirical analyses, we move beyond traditional approaches, offering a holistic understanding of academic expertise within higher education. Therefore, this study's findings provide a foundation for refining existing evaluation mechanisms, allowing for a more nuanced and accurate assessment of faculty expertise. The interplay of psychometric precision (Germain & Tejeda 2012), departure from functional analysis (Blackmore & Hatley 2022), alignment with contemporary expectations (Swanson 1994), and the evolving landscape of expertise assessment (Mølstad & Pettersson 2019) marks a significant contribution of this study to the ongoing discourse on expertise assessment in academia. Moreover, higher education institutions can utilize these insights to tailor professional development programs that address specific facets of expertise, fostering a holistic approach to academic growth.

Conclusion

This study has laid the groundwork for a comprehensive understanding of academic expertise, unravelling distinct dimensions and their interconnectedness in higher education institutions. The identified factors resulting from this study provide a framework for advancing the discourse on faculty development and assessment by distinguishing between the level of academic expertise and the level of academic competence. The final model of the academic expertise scale is aligned with the theoretical framework, emphasizing the integration of teaching, research, and community service, while simultaneously acknowledging the importance of teaching experience and recognition. The study has demonstrated a certain degree of strength of the model by showing a significant resemblance between two broad discipline categories in their perception towards each item measured. Furthermore, the identified factors form a foundation for developing a model to sustain and encourage academic growth.

The study makes a significant contribution to understanding academic expertise, but it also has certain limitations that should be acknowledged. First, there is not enough information provided on lecturers' academic experience among respondents, which could serve as an essential control variable to ensure that no significant difference arise due to varying levels of academic experience when perceiving the academic expertise scale. Secondly, a limited number of respondents in each discipline restricted us from applying measurement invariance. Therefore, future scholars are encouraged to aim for a larger sample size for each discipline.

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