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Assessing the Learning Styles of Pre-service teachers: Strategies for Enhancing Pedagogical Training

N. Jayapriya

Assistant Professor, Department of Education, Mizoram University, Aizwal.

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ABSTRACT

The present study intended to identify the learning style of pre-service teachers and to analyse the learning styles of pre-service teachers considering their population variables such as gender, subject specialization and region which they belong. The study was carried out with 329 pre-service teachers who currently doing their bachelor of education programme at various places of Tamilnadu and Telangana. To analyse the preferred learning style of the pre-service teachers VAK inventory which is developed and standardized by Dhanya Krishnan in the year 2011 was used. The findings of the present study reveal that visual learning is the most preferred learning style which is followed by auditory and kinesthetics. Furthermore, there were slight difference in learning style based on gender, subject specialization and region, but it was a moderate difference. However, there are variation across different learning style, highlighting the need for a mixed approach that integrates visual, auditory and kinesthetics methods. This will ensure that all the students, regardless of their preferred learning style, can learn effectively based on their strengths.

Introduction

Teacher education programs are crucial in determining the competencies and instructional approaches of future teachers. Teacher preparation plays a very significant role in the development of society. Students who enrol in B.Ed. program come from different areas bringing diversity in terms of socioeconomic background, age, educational experiences, competency level, and preferred learning strategies in a classroom is quit challenging for teacher educators. Therefore, the teacher educators need to understand their learners during the process of teaching-learning. The teacher educators need to change students' behaviour, attitude and skills to make them more effective teachers. The effectiveness of teacher training programme is significantly influenced by their alignment with the learning styles of pre-service teachers. Learning style denotes to the preferred means of individuals process information and acquire knowledge.

Each individual has diverse learning style with different capability to learn lesson. Some are attentive learners, the others are very slow learners, and hence the often must pass through a diverse way to be able to absorb lesson or to grab the sameinformation. Some pupils prefer writing to attending, and other prefers having conversation. The matured learners usually have learning style based upon their experience. Whatever the way is, learning style differences reveals the fastest and the best way for any individual to grasp information. Therefore, no individual fully learns through one learning style. Normally, a combination of one learning style with others will result in intelligence and significantly work. However, the meanings of ingenious and successful people are the bio cognitive ones that has the flexibility to familiarize the style (Brown, 2001). In other words, different

Corresponding author's Email:jayapriyanammalvar@gmail.com(N. Jayapriya)

contexts will not bring any influences toward the learning process.

There is a mismatch in learning style between teacher and student is common in teaching or learning situation. Teachers tend to prefer that come most easily to them. Meanwhile, the students are challenges to be able to use various learning styles adapt to variety of contexts and situations they will encounter. To solve this problem, teachers should pay attention to students' learning style (Ginting and Siti Aisyah, 2017).

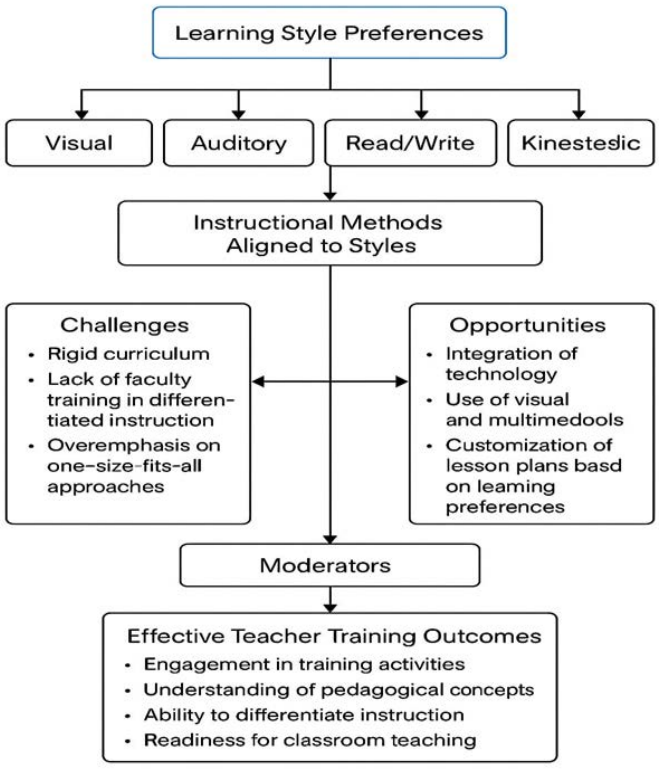
Experiential Learning Theory (David Kolb, 1984). According to Kolb's model, learning is a cycle process divided into four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. The application of the model in teacher training lies in the use of the activities such as microteaching, simulation of teaching situations, and reflective journals, to have the trainees undergo an experience of practical teaching, reflection on their performance, conceptualization of improvement areas, and application of new strategies in the next teaching practice.

Theory of Multiple Intelligences by Howard Gardner, 1983. According to Gardner's theory, there are at least eight different intelligences: linguistic, logical-mathematical, spatial, bodily kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. It challenges the theory of the single intelligence concept. Pre-service teachers learn about the different intellectual capacities of their students and activities that develop and encompass such intelligences in favour of inclusive and differentiated instruction.

Constructivist learning theory (Brunner, Vygotsky) constructivism is learning an active theory that engages the learner and involves interaction to build or structure knowledge through meaningful experiences. Nowadays, the constructivist aspect in teacher training has allowed peer teaching, collaborative learning and reflection on discussions of other learning styles to encourage deeper engagement and awareness among students.

Review of Literature

Many studies report a correlation between learning styles and academic success. For instance, Alrabai (2016) stated that students whose instruction matched their learning preferences scored better in science subjects. Allen et al. (2021) further reported that kinesthetic learners remained more engaged during hands-on activities, while visual learners performed better during diagram activities. However, many researchers have contested that learning style adaptation has an insignificant effect on long-term achievement (Pashler et al., 2009). In a collective consideration of the reviewed studies, the dimension of learning styles/preferences among students is further established as a phenomenon of considerable complexity and variability across contexts. From VARK and Vermunt's Learning Style Model in each case, the importance of synergetic matching of teachers' strategies to students' preferences in educational engagement and performance emerged as a recurring theme. In Nasir, Mughal, and Rind (2021) and Alkooheji and Al-Hattami (2018), contextually and situationally considered sources of learning preferences emphasize the need for multimodal instruction, with auditory, kinesthetic, and visual components. Based on Zeybek and Şentürk's (2020) research, demographic variables (gender and age) are presented as mediators for learning preferences to imply differentiated pedagogical interventions. Subramaniam Chetty et al. (2019) provided empirical confirmation of the vital interaction between style of teaching and styles of learning, whereby an inconsistency would negatively impact student achievement. Teaching strategies that effectively respond to differing learning styles have to be in place. In this way, differentiated instruction has been advocated, allowing teachers to offer diversity in learning activities (Tomlinson, 2014). Blended learning strategies that employ a combination of visual materials, classroom discussions, and hands-on activities can all appeal to various simultaneous learning preferences (Bishop & Verleger, 2013). Furthermore, technology-oriented teaching, through multimedia presentations and virtual simulations, has proven useful in enriching the learning experiences of different categories of learners (Mayer, 2020). Conclusively, the aforementioned evidence emphasizes the distinct recognition by dynamic, flexible, and student-centered teaching approaches of individual and contextual variability in learning preferences.



Rationale of the study

Teaching and learning are highly influenced by individual learning styles, which define how learners perceive, process, and retain information (Fleming and Baume, 2006). Studies indicate that mismatched teaching methods can lead to reduced motivation and academic performance, whereas personalized instruction enhances knowledge acquisition. (Newton and Salvi,2020). Pre-service teachers will eventually teach students with varied learning preferences. If teacher educators model differentiated instruction based on learning styles, pre-service teachers are more likely to implement similar strategies in their classrooms (Gilakjani, 2012). Understanding learning styles helps teacher educators to guide pre-service teachers in self-reflection and metacognitive awareness (Novak and Canas, 2008). When pre-service teachers recognize their learning preference, they can adjust their study habits, teaching approaches, and instructional planning to improve their effectiveness. This prepares them to create inclusive learning environments that accommodate diverse student needs. When the educators integrate diverse and innovative teaching methods, such as blended learning, flipped classroom and technology enhanced instruction help pre-service teachers to develop modern teaching competencies essential for 21st century classrooms. By understanding and addressing the learning styles of pre-service teachers, teacher educators can enhance the effectiveness of the training programme. This not only improves the learning experience for pre-service teachers but also equips them with the skills to implement differentiated instruction in their future classrooms.

Statement of the problem

Research indicates that individuals learn in different ways, and aligning instructional strategies with their preferred learning styles can improve engagement, retention, and overall academic success (Kolb, 2015; Fleming and Baume, 2006). However, many teacher education programme still rely on traditional lecture-based methods, which may not cater to the diverse learning needs of future educators (Newton and Salvi, 2020). Advancement in digital education provide new opportunities to integrate multimodal teaching strategies that accommodate various learning styles (Mayer, 2021). The lack of structured implementation in teacher education programs remains a challenge. Addressing these gaps by incorporating research-based strategies can lead to improved teacher preparedness and more effective classroom instruction. Specifically, the study wanted to answer the following: 1) What is the most preferred learning style of the pre-service teachers? 2) Is there any significant difference in their learning style based on gender, specialisation and region they belong? 3) How can teacher educators adopt their instructional strategies to address the needs of visual, auditory and kinesthetics learners?

Objectives of the present study

1. To identify the predominant learning style preference among the teacher trainees using the VAK model.
2. To identify instructional strategies that align with various learning styles to improve trainee engagement and teaching skill development.
3. To propose evidence-based strategies tailored to the learning styles of pre-service teachers.

Methodology

The present study adopts a descriptive survey design to gather, assess, describe and analyse data on the preferred learning styles of the 329 pre-service teachers from various parts of Tamilnadu and Telangana. The study's sample was selected using stratified random sampling method. The instrument adopted for present study was developed and standardized by Dhanya Krishnan (2011). It consists of 20 items with three options (Visual, Auditory and Kinesthetics) provided to choose from, and participants could choose any one option per item. Responses of pre-service teachers were scored on spread sheet (Excel) and tabulated. The investigator used frequency and percentage analysis to compare the choices of learning style made by population variables to each survey items.

Result and Discussion

The findings revealed in line with research questions of the study are given in this section. Percentage analysis related to the learning styles of pre-service teachers are discussed below.

What is the most preferred learning style of the pre-service teachers?

For testing the research question, the following results were found by the investigator.

Table-1: Frequency and Percentage of pre-service teachers preferred learning style

Learning	V		A		K	
Style	No.	%	No.	%	No.	%
Q1	129	39	90	27	110	34
Q2	107	33	160	49	62	18
Q3	87	26	201	61	41	13
Q4	82	25	119	36	128	39
Q5	75	23	199	60	55	17
Q6	158	48	76	23	95	29
Q7	190	58	71	21	68	21
Q8	173	53	60	18	96	29

Q9	227	69	55	17	47	14
Q10	88	27	100	30	141	43
Q11	150	45	124	38	55	17
Q12	90	27	96	29	143	44
Q13	147	45	72	22	110	33
Q14	144	44	70	21	115	35
Q15	117	36	82	25	130	39
Q16	181	55	46	14	102	31
Q17	121	37	72	22	136	41
Q18	162	49	87	27	80	24
Q19	121	37	106	32	102	31
Q20	191	58	76	23	62	19
	137	**42**	98	**30**	94	**28**

Table-1 shows the frequency and percentage of choices of each option per question. From the table it is concluded that the most preferred style of learning was visual. Then it is followed by auditory and kinesthetics. The difference between the auditory and kinesthetics are not huge, which indicate a tendency towards multi-module learning style, with some preference of both auditory and kinesthetics. Out of 20 questions students preferred twelve questions towards visual learning preference. Next to this for five questions pre-service students' choice of learning is toward kinesthetics. At last, three questions preferred for learning through auditory style.

2) Is there any significant difference in their learning style based on gender, specialisation and demography they belong? The following table represents the percentage analysis of learning style choices made by males and females to each survey items.

Table 2 presents the distribution of learning style choices per question for each gender. Overall, the results indicate that there are only a few questions where the preferred learning styles differ between males and females. Moreover, the percentages of responses in favour of the most chosen learning style (Visual, Auditory, or Kinesthetics) are relatively close for each question. Out of 20 questions, 14 questions (1, 2, 3, 6, 8, 11, 14, and 18) showed that both males and females had the highest percentage of choices for the same learning style. However, for questions 7, 9, 13,16, and 20 females had a higher frequency of choices compared to males. In contrast, question 19 showed a higher percentage of males' preference for a particular learning style. Notably, question 4 exhibited varying learning style choices between males and females. Furthermore, questions 5, 10, 12, 15, and 17 revealed a preference for kinesthetics and auditory learning styles.

Table-2: Frequency and Percentage of students preferred learning style with reference to gender

Gender	**Male**						**Female**					
Learning Style	**V**		**A**		**K**		**V**		**A**		**K**	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Q1	38	41	29	31	25	27	91	38	61	26	85	35
Q2	27	29	45	49	20	22	80	34	115	48	42	17
Q3	25	27	53	57	14	15	62	26	148	62	27	11
Q4	20	22	41	44	31	34	62	26	78	33	97	40
Q5	17	18	61	66	14	15	58	24	138	58	41	17
Q6	55	59	15	16	22	24	103	43	61	26	73	30
Q7	51	55	21	23	20	22	190	80	71	30	68	28
Q8	52	56	14	15	26	28	121	51	46	19	70	29
Q9	61	66	17	18	14	15	166	70	38	16	33	13
Q10	27	29	28	30	37	40	61	26	72	30	104	43
Q11	41	44	34	37	17	18	109	46	90	38	38	16
Q12	23	25	32	35	37	40	67	28	64	27	106	44
Q13	34	37	22	24	36	39	113	48	50	21	74	31
Q14	42	45	18	19	32	35	102	43	52	22	83	35
Q15	34	37	24	26	34	37	83	35	58	24	96	40
Q16	46	50	13	14	33	36	135	57	33	14	69	29
Q17	30	32	30	32	32	35	91	38	42	18	104	43
Q18	44	48	21	22	27	29	118	50	66	28	53	22
Q19	41	44	29	31	22	24	80	34	77	32	80	33
Q20	52	56	22	24	18	20	139	59	54	23	44	18
Total	38	**41**	28	**31**	26	**28**	101	**43**	69	**30**	67	**27**

Table-3: Frequency and Percentage of students preferred learning style with reference to specialization

Specialization	**Science**						**Social**					
Learning Style	**V**		**A**		**K**		**V**		**A**		**K**	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Q1	60	34	51	29	63	36	69	45	39	25	47	30
Q2	61	35	76	44	37	21	46	30	84	54	25	16
Q3	43	25	108	62	23	13	44	28	93	60	18	11
Q4	45	26	58	33	71	41	37	24	61	39	57	37
Q5	34	19	114	66	26	15	41	26	85	55	29	19
Q6	83	48	44	25	47	27	75	48	32	21	48	31
Q7	92	53	31	18	51	29	98	63	40	26	17	11
Q8	83	48	31	18	60	34	90	58	29	19	36	23
Q9	116	66	24	14	34	19	111	72	31	20	13	8
Q10	49	28	53	30	72	41	39	25	47	30	69	44
Q11	75	43	63	36	36	20	75	48	61	39	19	12
Q12	45	26	52	30	77	44	45	29	44	28	66	42
Q13	76	44	35	20	63	36	71	46	37	24	47	30
Q14	73	42	35	20	66	38	71	46	35	23	49	31
Q15	63	36	39	22	72	41	54	35	43	28	58	37
Q16	92	53	23	13	59	34	89	57	23	15	43	28
Q17	67	38	37	21	70	40	54	35	35	22	66	42
Q18	88	50	45	26	41	23	74	48	42	27	39	25
Q19	65	37	44	25	65	37	56	36	62	40	37	24
Q20	109	62	36	21	29	16	82	53	40	26	33	21
Total	71	**41**	50	**29**	53	**30**	66	**43**	48	**31**	41	**26**

Table 3 presents the frequency and percentage of students' preferred learning styles based on their subject specialization. Overall, there are only a few questions where the preferred learning styles differed between science and social science pre-service students. Analyzing the percentage of responses in favour of the most chosen learning style among visual, auditory, and kinesthetics reveals that the preferences are relatively close for each question. Among the 20 questions, both science and social science students exhibited the same preferred learning style in eleven questions (1, 6, 8, 9, 11, 13, 14, 15, 17, 18, and 19). Additionally, for Q7, Q9, Q16, and Q20, both groups showed a strong preference for visual learning. In contrast, for Q2, Q3, and Q5, students from both specializations favoured auditory learning. Notably, in Q4, Q10, and Q12, pre-service students exhibited a preference for kinesthetics learning

Table-4: Frequency and Percentage of students preferred learning style with reference to region

Region	**Tamilnadu**						**Telangana**					
Learning Style	**V**		**A**		**K**		**V**		**A**		**K**	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Q1	90	**41**	66	30	62	28	39	35	24	21	48	**43**
Q2	77	35	100	46	41	19	30	27	60	54	24	22
Q3	44	20	149	68	25	11	43	39	52	47	16	14
Q4	56	25	89	**41**	73	33	26	23	30	27	55	**49**
Q5	56	26	132	60	30	14	19	17	67	60	25	22
Q6	106	48	46	21	66	30	52	47	30	27	29	26
Q7	126	58	55	25	37	17	64	58	16	14	31	28
Q8	121	55	49	22	48	22	52	47	11	10	48	43

Q9	170	78	28	13	20	9	57	51	27	24	27	24
Q10	58	26	68	31	92	42	30	27	32	29	49	44
Q11	87	40	96	**44**	35	16	63	**57**	28	25	20	18
Q12	62	28	64	29	92	42	28	25	32	29	51	46
Q13	94	43	55	25	69	31	53	48	17	15	41	37
Q14	97	44	58	27	63	29	47	42	12	11	52	47
Q15	85	**39**	60	27	73	33	32	29	22	20	57	**51**
Q16	122	56	37	17	59	27	59	53	9	8	43	39
Q17	79	36	53	24	86	39	42	38	19	17	50	45
Q18	106	48	54	25	58	26	56	50	33	29	22	20
Q19	80	37	77	35	61	28	41	37	29	26	41	37
Q20	122	56	52	24	44	20	69	62	24	21	18	16
Total	92	**42**	69	**32**	57	**26**	45	**41**	29	**26**	37	**33**

Table 4 presents the analysis of learning style preference based on the region of pre-service students. The percentage analysis was carried out to find out the difference between the pre-service students belongs to Tamilnadu and Telangana. While comparing the preferred learning styles across Tamilnadu and Telangana pre-service students show both similarities and differences. Tamilnadu students strongly prefer visual learning, while Telangana students exhibits a more balanced distribution across visual, auditory and kinesthetics learning styles. Among the 20 both region pre-service students show the similar preference for seven questions (6, 7, 8, 13, 14, 19, and 19). However, for questions 2, 3, and 5 students shows strong preference to auditory learning and for questions 9, 16, and 20 strong inclinations towards visual learning. Additionally, for questions 10, 12, and 17 both region students showed a strong preference for kinesthetics learning style. In contrast, for the questions 1, 4, 11, and 15 revealed varying learning style preferences between the two groups.

Findings of the study

In overall visual learning turned out to be the most dominant learning preference among pre-service students, as it was highly favoured in most of the 20 questions. Following quite closely were auditory and kinaesthetic preferences which turned out to be strikingly balanced, showing a tendency towards learning being multimodal. Interestingly, 12 out of the questions were highly preferred as visual, 5 kinaesthetic, and 3 auditory. Therefore, visual learning is dominant; however, these students also appreciate some level of auditory and tactile involvement.

A comparative analysis of the preferred learning style based on the gender both male and female prefer visual learning overall, with auditory learning as the second choice and kinesthetics as the least preferred. The findings suggest that visual learning is the most dominant learning style across genders. Auditory learning has notable representation in questions 2, 3, 5 and 17 particularly among females. Males show a stronger preference for visual learning over the other two styles. Kinesthetics learning is the least preferred across both genders, but males display a slightly higher inclination toward it compared to females.

While comparing the preference of learning style based on the specialization both science and social students prefer visual learning the most, but science students display a more balanced distribution across all three learning styles, whereas social science students focus more on visual and auditory learning. Kinesthetics learning is slightly stronger among science students compared to social students.

As a result of percentage analysis based on the region which the students belong the Telangana pre-service students showed a slightly higher inclination towards kinesthetics learning, while Tamilnadu pre-service students learned more toward auditory methods. But the most preferred learning style for both region students is visual learning.

Discussion

The results reveal that visual learning comes out as the most dominantly preferred style by both male and female pre-service teachers to the possible expected outcome of their sharing common interest with visual aids like diagrams, videos, and written materials. This would be in line with earlier research work from Fleming and Baume (2006) that elucidated how much visual materials support one's understanding and retention of knowledge. Kinesthetic learning was the least cherished across both genders, although with males having a slight lean toward such modality. This may indicate higher comfort levels of male trainees in movement, physical activities, and hands-on experiences for learning, albeit not being their preferred style of learning. When comparing pre-service teachers' academic background, it is clear that science and social science pre-service teachers have a preference for the visual mode of learning such that the latter between the two subgroups will further emphasize

learning through viewing. With respect to balanced distribution in between visual, auditory and kinesthetic styles, science students showed such a flexibility in adapting to the different modes of learning offered through the way in which the nature of learning could be described in terms of the above enactments. This was characteristic of scientific learning, which often combined visual representation (for instance, graphs and experiments), auditory instruction (lectures), and kinesthetic practice (laboratory work). In comparison to this scenario, study shows that social science students were inclined towards highly visual and auditory modes with very little preference for kinesthetic strategies. This would imply that pedagogical methods that include presentations, storytelling, and discussions would form a hearty ground for social science learners. Regional analysis indicates variability in preferences. In the case of kinesthetic, it seems that pre-service teachers from Telangana showed an ever-so-slightly higher preference, whereas in the case of the auditory, pre-service teachers favored Tamil Nadu. In the case of visual learning, however, that is a predominant preference across theirs and even in this study. Differences in educational practices, the availability of learning resources, and exposure to diverse teaching methodologies may influence the preference types developed by learners from different states. The slight shift in preference for kinesthetic by Telangana students tends to indicate learning-by-doing environments and activity-based learning more pronounced in this region. In contrast, the auditory preference in Tamil Nadu would hint at a more traditional approach which is lecture-driven or teacher-centered, depending heavily on verbal instruction.

Implication of the study

The teacher education programs ought to provide a holistic and inclusive environment in the training of prospective teachers and in catering to the diversity of their learning preferences. Whereas visual learning appears to be the strongest preference among student teachers, the application of multi-modal instructional strategies reaffirms that all learners are given a fair chance of getting an education. Such strategies should mainly be supported by teacher educators using visual aids, discussions in groups, role-playing, and some hands-on activities. Such an inclusive approach builds motivation while enhancing the instruction's effectiveness. Assessment of learning styles, for instance, the VARK questionnaire, should be incorporated right at the beginning of teacher training programs. This would inform both the educator and the pre-service teacher of their respective learning preferences, thus enabling the formulation of more individual-centered and responsive learning experiences. Such understanding of learning style creates an early pathway for trainees to understand the great diversity that they will be faced with in their future classrooms. Depending on that understanding, there is also a strong case to strengthen visual pedagogies in the teacher education curriculum, given the high prevalence of visual learners. Teachers should emphasize the use of diagrams, infographics, PowerPoints, and educational videos for the maximum comprehension and retention of pedagogical content. Such tools applied within unit design and lesson delivery would equip pre-service teachers better for effective classroom teaching. To make sure that these strategies are enforced well with integrity, faculty training is also key. Teacher educators should receive continuous professional development lectures emphasizing differentiated instruction and learning styles. This equips them with the necessary knowledge and skills to model adaptive teaching skills and support diverse learners in a competent way. Additionally, enhancing reflective practice within the context of pre-service teacher training is important. Educators reflecting on their own styles of learning and how such may impact their styles of teaching would sharpen their awareness and intent in considering how to address the specific learning needs of their future students. This reflective pathway builds professional development while ensuring the growth of inclusive practices. Since the regional variations of learning preferences exist, schools and colleges of education may customize their training modules for their local educational cultures and student demands. Such customized content will serve to improve the relevance and significance of the training offered. Research into learning styles and their impact on other teaching efficacy must continue as an important avenue for investigation. Longitudinal and large-scale research would provide insight on how these preferences change over time, and how they ultimately feed into classroom success during in-service years.

Conclusion

The findings give support for the notion that knowledge of individual learning style can form a productive basis for curriculum planning, implementation and evaluation. Increasing our knowledge and understanding of the learning styles preferred by our students can provide a rationale for course design as well as a model for the learning process. In our teacher education programs we should inform students of their preferred learning styles. We should not be interested in providing this information for its own sake but to provide knowledge to the students about how they learn so that they are then empowered to control their own learning through the style they use or the adaptations they are able to make in style according to particular learning purposes and / or environments. To encourage good learning it is not enough to merely accommodate and support preferred learning styles. We should devise learning activities for our students that cater for a range of learning styles and plan for activities that will encourage the learner to develop

more confidence and strength in less preferred styles thus enabling students to expand their learning style repertoire.

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